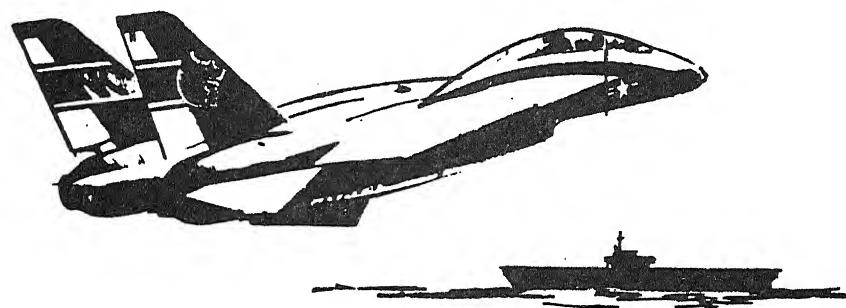




**PROGRESS CHECK BOOKLET**  
**AVIONICS TECHNICIAN COURSE**

**CLASS A1**

**C-100-2013**



**UNIT I**

**VOLUME I**  
**MODULES 1 THRU 8**

**(Rev. 7/84)**

**CNTT-M1404**

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## LESSON TOPIC PROGRESS CHECK

## SAFETY AND TOOL INVENTORY

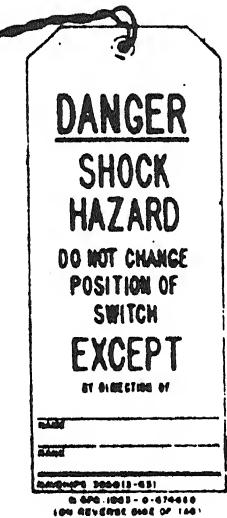
## Lesson Topic Learning Objectives:

1. Select, from a list, three general categories of safety that relate directly to safety on the job.
2. Select, from a list, two items used in an avionics shop to help protect technicians from electrical shock.
3. Select, from a list, four preliminary checks that must be performed before ground operation of equipment with hazardous levels of rf radiation.
4. Given a group of illustrations of warning signs and a list of conditions, match each sign to the condition it indicates.
5. Select, from a list, two environmental factors that technicians can help control within their own work areas.
6. Select, from a list, the personal safety practices that are particularly important in electronics work.
7. Select, from a list, two items that are usually kept in an avionics work area for use in case of emergencies.
8. Select, from a list, the statements that describe the standard procedure for inventory of tools in accordance with OPNAV INST 4790.2 series.
9. Select, from a list of statements, steps in the standard inventory procedure for tools, equipment, and supplies used in assigned labs.
10. Select, from a list, the persons responsible for the inventory of tools both before and after a maintenance action.
11. Select, from a list of statements, the benefits derived from using the Tool Control Program inventory procedure during a maintenance action.

1. Select three general categories of safety factors that relate directly to safety on the job.
  - a. Condition of the work area.
  - b. Lab practice in "A" school.
  - c. Condition of tools and equipment.
  - d. Type of squadron/ship to which assigned.
  - e. Personal attitude.
2. Select two items used in avionics shops to help protect technicians from electric shock.
  - a. Rf transmitters.
  - b. Test equipment.
  - c. Rubber mats.
  - d. Shorting bar.
  - e. Alligator clips.
3. Select four preliminary checks that must be performed before ground operation of equipment with hazardous levels of rf radiation.
  - a. Area must be clear of fuel-handling activity.
  - b. Area must be clear of all test equipment.
  - c. Area must be clear of liquid oxygen-handling activity.
  - d. Area must be clear of personnel.
  - e. Area must be clear of aircraft.
  - f. Area must be clear of ordnance-handling activity.
  - g. Area must be clear of ground support equipment.

4. Match each of the following warning signs to the appropriate condition.

a. \_\_\_\_\_

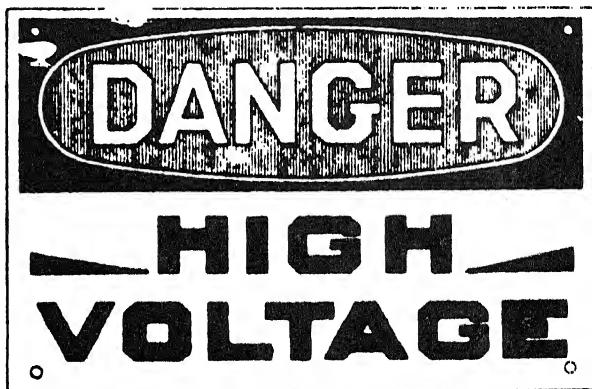


1. Maximum voltage in work area is from a 24 vdc power source.
2. A high-power transmitter is being tested in the work area.
3. Minimum voltage is from a 115vac power source.
4. A technician is working on equipment that is connected to the power source.
5. A technician is working on an item of deenergized equipment remote from the control box.
6. Radioactive material is being used in the work area.

b. \_\_\_\_\_



c. \_\_\_\_\_



5. Select two environmental factors technicians can control within their work area.
  - a. Lighting design.
  - b. Heat distribution.
  - c. Cleanliness.
  - d. Ventilation.
  - e. Orderliness.
6. Select the personal safety practices that are particularly important in electronic work.
  - a. Keep one hand behind you when working on energized circuits.
  - b. Deenergize equipment before replacing parts.
  - c. Keep one hand on ground when working on live circuits.
  - d. Wear safety items appropriate to the situation.
  - e. Ensure OFF-ON switch is on before plugging in electronic equipment.
7. Select two items that are kept in avionics work spaces for use in case of emergencies.
  - a. Flares.
  - b. CO<sub>2</sub> fire extinguisher.
  - c. Compass.
  - d. First aid kit.
  - e. Rubber mats.

8. Select the statement(s) that describe the standard procedure for the inventory of tools in accordance with OPNAV INST 4790.2.
  - a. Tools must be sight inventoried both before and after a maintenance action.
  - b. All tool shortages must be reported to the work supervisor after the maintenance action has been signed off.
  - c. All tools should be removed from their container before starting the maintenance action.
  - d. All tools should be properly marked and easily identified with the correct container.
  - e. Common tools that are normally used on most maintenance actions should be kept in the technicians pocket.
9. Select two statements that describe the inventory procedure used to inventory tools and equipment used in assigned labs.
  - a. Borrow needed tools from the next position.
  - b. Inventory tools and equipment at the assigned position against the master inventory list both before and after the lab assignment.
  - c. Make a list of tools and equipment at the assigned position.
  - d. Immediately report missing or damaged tools or equipment to the supervisor.
  - e. Inventory tools and equipment at the assigned position only when you discover something missing.

10. Select the persons responsible for the inventory of tools both before and after the maintenance action.
  - a. Maintenance Officer
  - b. Plane Captain
  - c. Commanding Officer
  - d. Work Supervisor/CDI
  - e. Technician
11. Select the benefits that are obtained by using the tool control program inventory procedure during maintenance actions.
  - a. Equipment is always fail-safe.
  - b. Helps to insure that all items are on hand for future use.
  - c. Obvious defects are discovered and can be corrected.
  - d. Helps to insure that no tools are left loose in the aircraft.
  - e. Fewer technicians are required to complete the maintenance action.

## LESSON TOPIC PROGRESS CHECK GUIDE

## SAFETY AND TOOL INVENTORY

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. a,c,e	41	1
2. c,d	42	2
3. a,c,d,f	44	4
4. a5 b2 c3	43-46	4,7,8
5. c,e	46	12
6. a,b,d	46,47	15
7. b,d	47	17
8. a,d	48,49	22
9. b,d	49	23
10. d,e	49	24
11. b,c,d	50	27

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LESSON TOPIC PROGRESS CHECK  
INTRODUCTION TO AM COMMUNICATIONS

## Lesson Topic Learning Objectives:

1. Select, from a list, the minimum requirements for a two-way communications system.
2. Given a group of electronics symbols and a list of component names, match each electronic symbol to the name of the component it represents.
3. Given a list of electronic components and a list of functions, match each electronic component with the correct function.
4. Given a block diagram of an AM communications system with designated points and a group of drawings illustrating waveforms, match each point to the waveform that is normally present at that point.
5. Given a list of frequency bands, select the band that is limited to line-of-sight communications.
6. Select, from a list statements, the purpose of modulation.
7. Given a list of statements, select the definition of a block diagram.
8. Select, from a list, the four sections of a basic AM transmitter.
9. Select, from a list, the four sections of a basic AM receiver.

1. Select the requirements for a two-way communications system.

- a. One transmitter, one receiver, and one antenna.
- b. Two transmitters, two receivers, and two antennas.
- c. Two transmitters, one receiver, and two antennas.
- d. One transmitter, two receivers, and two antennas.
- e. One transmitter, one receiver, and two antennas.

2. Match each electronic symbol with the name of the electronic component it represents.

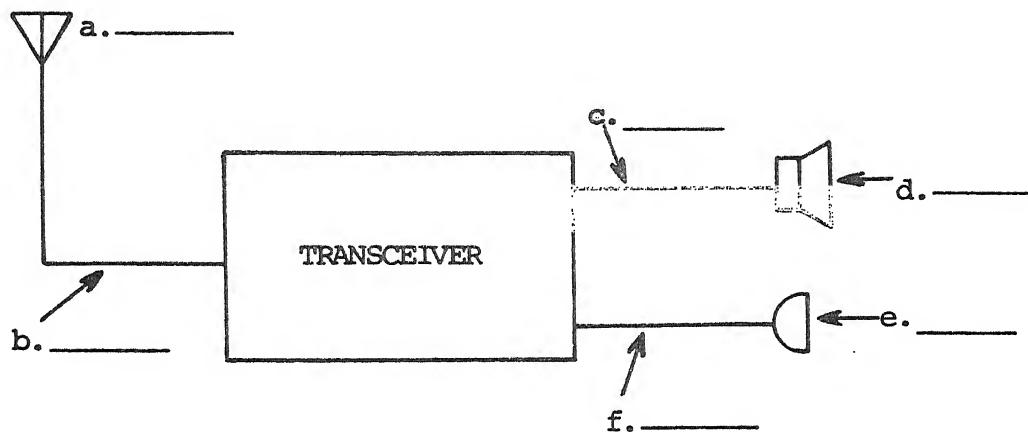
- a.  \_\_\_\_\_
- b.  \_\_\_\_\_
- c.  \_\_\_\_\_
- d.  \_\_\_\_\_

- 1. Antenna.
- 2. Speaker.
- 3. Headset.
- 4. Receiver.
- 5. Microphone.

3. Match each component listed below with the correct function.

- a. Antenna. \_\_\_\_\_ 1. A device that converts audio-frequency voltages into acoustic (sound) waves.
- b. Headset/Speaker. \_\_\_\_\_ 2. A device that converts sound energy into audio-frequency voltages.
- c. Microphone. \_\_\_\_\_ 3. A device for radiating or intercepting electromagnetic waves.
- 
- 4. A device used for converting radio (electromagnetic) waves into sound waves.

4. Match the designated points on the block diagram of an AM communications system to the waveform that is normally present at that point.



1. audio-frequency voltage.
2. sound energy.
3. rf waveform.
4. electromagnetic waves.
5. dc voltage.

5. Select the frequency band that is limited to line-of-sight communications.
  - a. LF
  - b. MF
  - c. UHF
  - d. HF
6. Select the statement that describes the purpose of modulation.
  - a. Cancel harmonics generated in the transmitter output.
  - b. Remove intelligence from a carrier wave.
  - c. Eliminate distortion by removing noise spikes.
  - d. Place intelligence on the carrier wave.
  - e. Provide a high signal-to-noise ratio.
7. Select the definition of a block diagram.
  - a. A diagram that illustrates the interconnecting wiring between the various stages of an electronic system or equipment.
  - b. A diagram that gives an overall symbolic representation of the functional units of an electronic system or equipment and the signal paths.
  - c. A diagram in which the component parts (such as resistors, capacitors, etc.) are represented by simple, easily drawn symbols.
  - d. A diagram of the electrical scheme of a circuit, with components represented by graphical symbols.

8. Select the four sections of a basic AM transmitter.

- a. Oscillator, modulator, power amplifier, and key.
- b. Oscillator, power amplifier, modulator, and power supply.
- c. Power supply, modulator, buffer, and power amplifier.
- d. Modulator, power supply, key, and buffer.
- e. Key, modulator, oscillator, and buffer.

9. Select the four basic sections of a AM receiver.

- a. Antenna, selector, modulator, and reproducer.
- b. Selector, reproducer, headset, and antenna.
- c. Antenna, selector, detector, and reproducer.
- d. Selector, detector, reproducer, and speaker.
- e. Headset, antenna, selector, and modulator.

## LESSON TOPIC PROGRESS CHECK GUIDE

## INTRODUCTION TO AM COMMUNICATION

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE (s)</u>	<u>P.I. FRAME (s)</u>
1. b	49	1
2. a 2 b 5 c 3 d 1	50	3
3. a 3 b 1 c 2	50	6
4. a 4 b 3 c 1 d 2 e 2 f 1	51	10
5. c	52	14
6. d	56	19
7. b	58	23
8. b	62	27
9. c	63	31

## LESSON TOPIC PROGRESS CHECK

## BLOCK DIAGRAM OF A SUPERHETERODYNE AM RECEIVER

## Lesson Topic Learning Objectives:

1. Select, from a list, the definition of heterodyning.
2. Select, from a list, the advantages of a superheterodyne AM receiver over a basic AM receiver.
3. Given a list of AM receiver stages and a list of functions, match each stage to the function it performs.
4. Given an unlabeled block diagram of an AM receiver and a list of receiver stages, match each designated stage to the appropriate numbered block.
5. Given a block diagram of an AM receiver, a list of stages, and a group of drawings illustrating signals, match each stage to the correct input/output signal.
6. Given a block diagram of an AM receiver, a list of test points selected from the block diagram, and a list of receiver stages, match each test point to the appropriate stage.

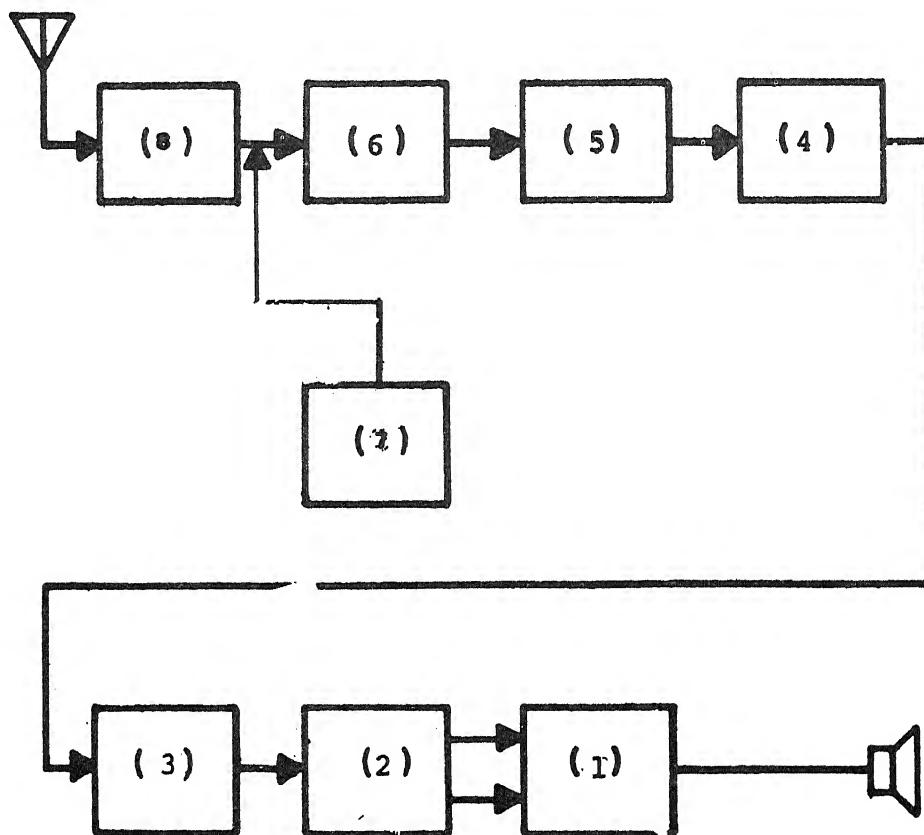
1. Select the definition of heterodyning.
  - a. The process of combining two different frequencies in such a way that two new frequencies are produced, equal to the product and difference of the input frequencies.
  - b. The process of combining two different frequencies in such a way that two new frequencies are produced, equal to the sum and difference of the input frequencies.
  - c. The process of applying an unmodulated waveform to a tuned circuit, producing the sum and difference frequencies.
  - d. The process of applying a modulated waveform to a tuned circuit to recover the intelligence.
  - e. The process of combining two identical frequencies in such a way that two new frequencies are produced, equal in amplitude and opposite in polarity.
2. Select the advantages of a superheterodyne AM receiver over a basic AM receiver.
  - a. Better gain and selectivity.
  - b. Better modulation and demodulation.
  - c. Does not require heterodyning.
  - d. Does not require amplifiers or tuned circuits.
  - e. Does not require amplification of the audio signal.

3. Match each stage to the function it performs.

<u>      </u> a. RF amplifier.	1. Mix the incoming modulated rf signal with an unmodulated rf signal from the local oscillator to produce the i-f.
<u>      </u> b. Local oscillator.	2. Produce two signals, equal in amplitude, and opposite in polarity.
<u>      </u> c. Mixer.	3. Generate an unmodulated rf signal that is applied to the mixer for heterodyning.
	4. Amplify the audio signal.
	5. Amplify selected rf signals.

4. Match each of the following stages of a superheterodyne AM receiver to the correct block on the unlabeled block diagram.

- a. Rf amplifier.
- b. Mixer.
- c. Second i-f amplifier.
- d. Detector.
- e. Audio power amplifier.



5. Refer to the block diagram of the superheterodyne AM receiver and match each stage listed below to the correct output signal.

- a. Second i-f amplifier.
- b. Detector.
- c. Audio driver.
- d. Audio power amplifier.

1.



2.



3.



4.



5.



6.

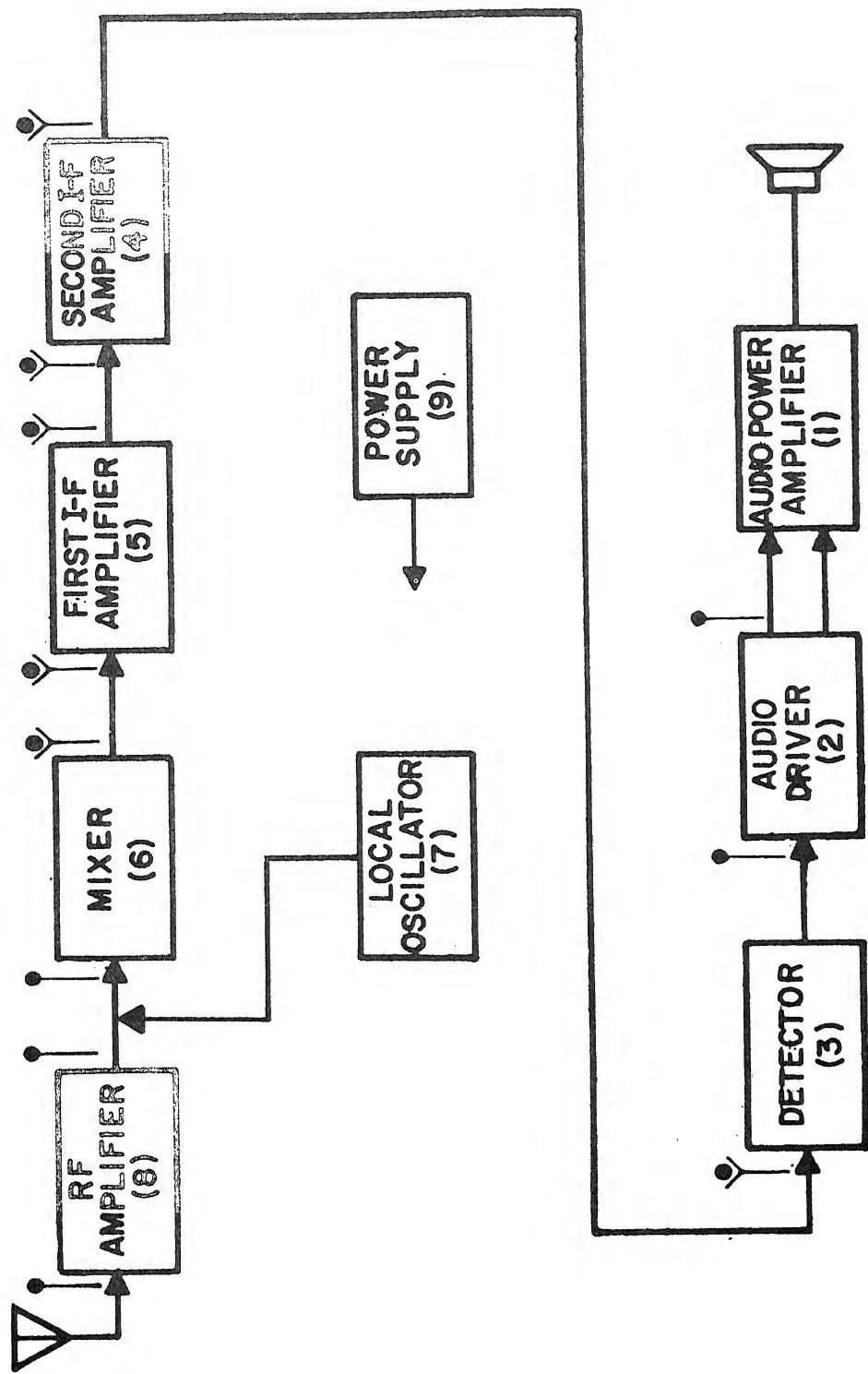
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7.



6. Refer to the block diagram of the superheterodyne AM receiver and match each of the following test points/test jacks to the stage that may be checked by injecting the proper signal at that point.

<u>      </u> a. TP2	1. Mixer
<u>      </u> b. TJ1	2. Detector
<u>      </u> c. TJ5	3. Audio driver
<u>      </u> d. TP3	4. Local oscillator
	5. First i-f amplifier



BLOCK DIAGRAM  
SUPERHETERODYNE AM RECEIVER

## LESSON TOPIC PROGRESS CHECK GUIDE

## BLOCK DIAGRAM OF A SUPERHETERODYNE AM RECEIVER

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(s)</u>	<u>P.I. FRAME(s)</u>
1. b	65	3
2. a	67	5
3. a 5 b 3 c 1	67 63 63	8 10 12
4. a 8 b 6 c 4 d 3 e 1	72 72 72 72 72	27 27 27 27 27
5. a 5 b 2 c 1 d 4	74 75 75 75	35 35 35 35
6. a 3 b 2 c 5 d 1	76 76 76 76	38 38 38 38

## LESSON TOPIC PROGRESS CHECK

## USE OF COMMON TEST EQUIPMENT

## Lesson Topic Learning Objectives:

1. Select, from a list of statements, the purpose of a signal generator.
2. Select, from a list, the frequency range of the designated signal generator.
3. Given a list of front panel controls for the signal generator and a list of functions, match each control to the proper function.
4. Select, from a list, the procedure for selecting the operating frequency of the signal generator.
5. Select, from a list, three common uses for an oscilloscope.
6. Given a list of front panel controls for the designated oscilloscope and a list of functions, match each control to the proper function.
7. Select, from a list, three functions of a Vacuum-Tube Voltmeter (VTVM).
8. Given a list of front panel controls for the VTVM and a list of functions, match each control to its proper function.

## PROGRESS CHECK (Self-Test)

1. What is the purpose of a signal generator?
  - a. Produce a variable dc voltage for testing purposes.
  - b. Produce a cw signal at a fixed frequency over a continuous range of frequencies.
  - c. Produce an audio frequency of fixed amplitude for testing purposes.
  - d. Produce a reference voltage waveform of known frequency, amplitude, and waveshape for testing purposes.

2. What is the frequency range of the AN/URM-25D signal generator?
  - a. 10Hz to 50MHz.
  - b. 10kHz to 100kHz.
  - c. 10kHz to 50MHz.
  - d. 50MHz to 50kHz.
  - e. 10kHz to 50kHz.
3. Match the following AN/URM-25D signal generator controls with their respective functions.

<u>      </u> a. Main Tuning Dial	1. Adjusts the audio output level.
<u>      </u> b. Microvolts control	2. Selects the desired frequency.
<u>      </u> c. Carrier control (Set carrier to 10)	3. Sets the carrier to a reference.
	4. Adjusts rf output of the signal generator.
4. Select the correct procedure(s) for obtaining a correct frequency from the AN/URM-25D signal generator.
  - a. Adjust carrier meter zero control for full scale deflection.
  - b. Select the desired rf output level.
  - c. Set the carrier range switch to a position that includes the desired frequency.
  - d. Set the frequency band switch to the desired frequency band.
  - e. Turn the main tuning dial until the desired value on the frequency scale coincides with the hairline.

5. Select three common uses for an oscilloscope.
  - a. Voltage measurements.
  - b. Current measurements.
  - c. Waveform comparison.
  - d. Resistance measurements.
  - e. Waveform time measurements.
6. Match the following controls for the AN/USM-281D oscilloscope to their corresponding function.

<u>  </u> a. Intensity	1. Selects the synchronizing signal.
<u>  </u> b. Focus	2. Adjusts the horizontal position of the trace.
<u>  </u> c. Horizontal Position	3. Adjusts the sharpness of the trace.
<u>  </u> d. CH1 Position	4. Selects the time that each horizontal grid square represents.
<u>  </u> e. Vertical Mode	5. Adjusts the brightness of the trace.
	6. Adjusts the vertical position of the trace.
	7. Selects the mode of operation.
7. Select the functions of the VTVM.

a. Waveform time measurements.	e. Frequency measurements.
b. AC voltage measurements.	f. Power measurements.
c. Current measurements.	g. Resistance measurements.
d. Positive dc voltage measurements.	h. Negative dc voltage measurements.

8. Match each of the following front panel controls for a VTVM to their proper function.

<u>      </u> a. Function switch	1. Selects the correct operating frequency.
<u>      </u> b. Range switch	2. Balances the meter for an infinite reading for resistance measurements.
<u>      </u> c. OHMS ADJ	3. Selects -DC, +DC, AC, MILS, or OHMS.
<u>      </u> d. ZERO ADJ	4. Balances the meter for a zero reading for all functions.
	5. Balances the meter for all functions except ohms.
	6. Selects the desired range for a particular measurement.

## LESSON TOPIC PROGRESS CHECK GUIDE

## USE OF COMMON TEST EQUIPMENT

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	NARRATIVE PAGE(s)	P.I. FRAME(s)
1. d	42	1
2. c	42	1
3. a 2 b 4 c 3	45 44 44	6 6 6
4. c d e	46	9
5. a c e	49	15
6. a 5 b 3 c 2 d 6 e 7	49 49 50 50 50	17 17 17 20 20
7. b c d g h	54	27
8. a 3 b 6 c 2 d 4	54 54 54 54	29 29 29 29

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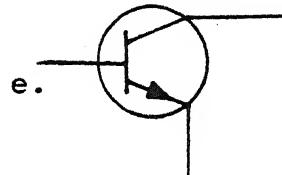
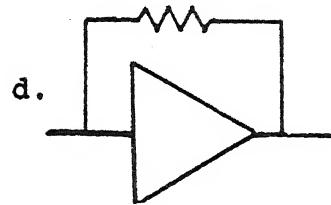
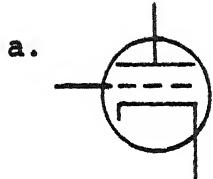
## LESSON TOPIC PROGRESS CHECK

## TRANSISTORS

## Lesson Topic Learning Objectives:

1. Select, from a group of schematic symbols, the symbol for a diode.
2. Select, from a list, the electrical characteristics of a diode.
3. Select, from a list, the function of a transistor.
4. Given the names of transistor elements and the schematic symbol of a transistor with elements numbered, match each name to the correct numbered element.
5. Given a group of schematic symbols, select the symbol for a designated transistor.
6. Select, from a list, three uses of the arrowhead on the schematic symbol of a transistor.
7. Select, from a list, the construction feature of some transistors that identifies the emitter lead.
8. Select, from a list, the type of emitter base bias required for current to flow in a transistor circuit.
9. Given a list of transistor elements and a list of percentages, match each element to the approximate percentage of current flow in that element.
10. Given a schematic diagram of a simplified transistor circuit and a list of possible circuit actions, select the effects of changing emitter-base forward bias.
11. Select, from a group of drawings, the schematic drawing of a simplified transistor bias circuit.
12. Select, from a list, three effects that a sine wave input has on the operation of a transistor circuit.
13. Given a list of classes of bias and a list of degrees of current flow, match each class of bias with the degree of collector current flow in relation to the input signal.

1. Which of the following schematic drawings represent a diode?



2. Select the electrical characteristics of a diode.

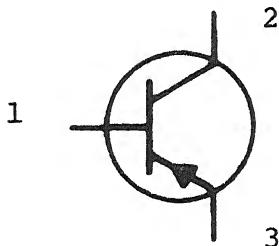
- a. Forward bias aids current flow, while reverse bias opposes it.
- b. Forward bias opposes current flow, while reverse bias aids it.
- c. Current flow in a diode is unidirectional.
- d. Current flow in a diode is bidirectional.
- e. Diodes offer high resistance to current flow in either direction.

3. What is the function of a transistor?

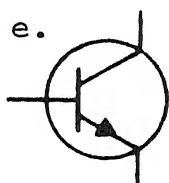
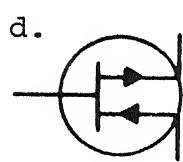
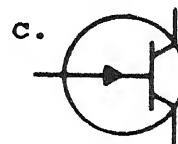
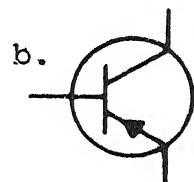
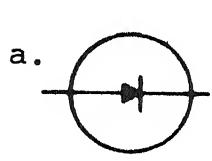
- a. Amplify a signal by controlling voltage.
- b. Amplify a signal by controlling current.
- c. Eliminate the need for passive electronic components.
- d. Amplify a signal by eliminating circuit resistance.
- e. Converts ac to dc.

4. Match each transistor element name with the correct element on the schematic illustration.

- a. Collector
- b. Base
- c. Emitter



5. Select the schematic symbol for an NPN transistor.



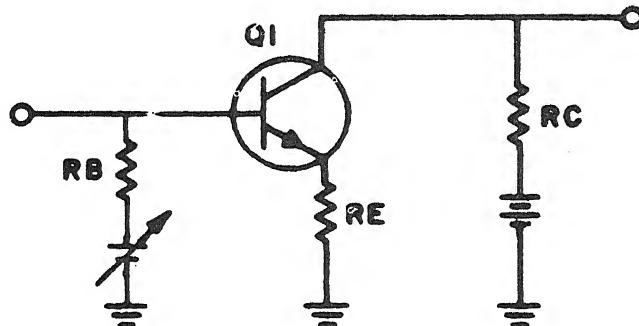
6. Select the three functions of the arrowhead on the schematic symbol of a transistor.

- a. Indicates the type of transistor.
- b. Indicates the collector.
- c. Indicates the emitter.
- d. Indicates the direction of current flow.
- e. Indicates the base.

7. Select the construction feature that identifies the emitter lead on some transistors.
  - a. A tab is adjacent to the emitter.
  - b. A red dot is adjacent to the emitter.
  - c. The emitter lead is longer.
  - d. The emitter lead is shorter.
  - e. The emitter lead is slightly bent.
8. Select the type of emitter-base bias required for current to flow in a transistor circuit.
  - a. Zero bias.
  - b. Forward bias.
  - c. Reverse bias.
  - d. Cutoff bias.
  - e. Inverse bias.
9. Match each transistor element to the approximate percentage of current that normally flows in that element.

<u>  </u> a. Emitter.	1. 0.1 to 1.0%
<u>  </u> b. Base.	2. 0.5 to 5.0%
<u>  </u> c. Collector.	3. 95 to 99.5%
	4. 100%
	5. 0.1 to 15.0%

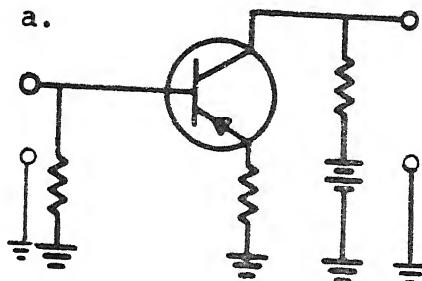
10. Select the effects of increasing forward bias on the transistor emitter-base junction shown below.



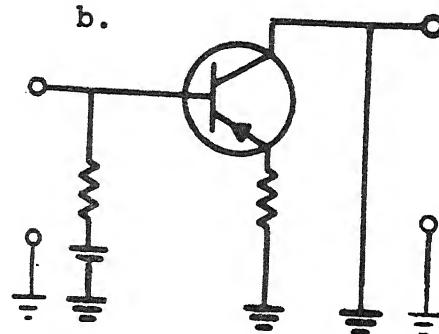
- a. VRC increases.
- b. VC increases.
- c. VC decreases.
- d. Current flow through Q1 increases.
- e. Current flow through Q1 decreases.
- f. VRC decreases.

11. Select the simplified transistor bias circuit from the schematics below

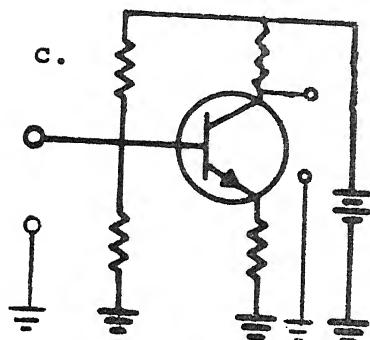
a.



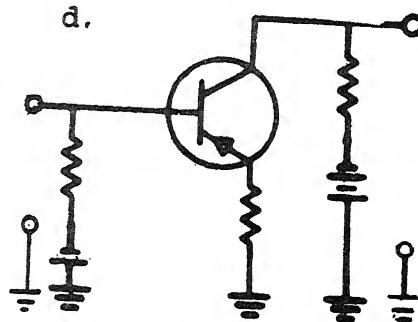
b.



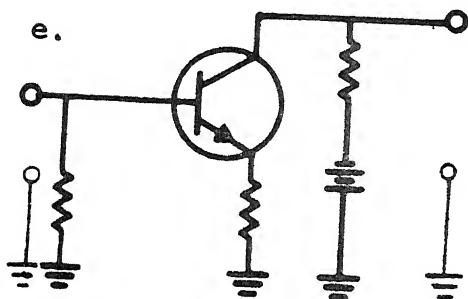
c.



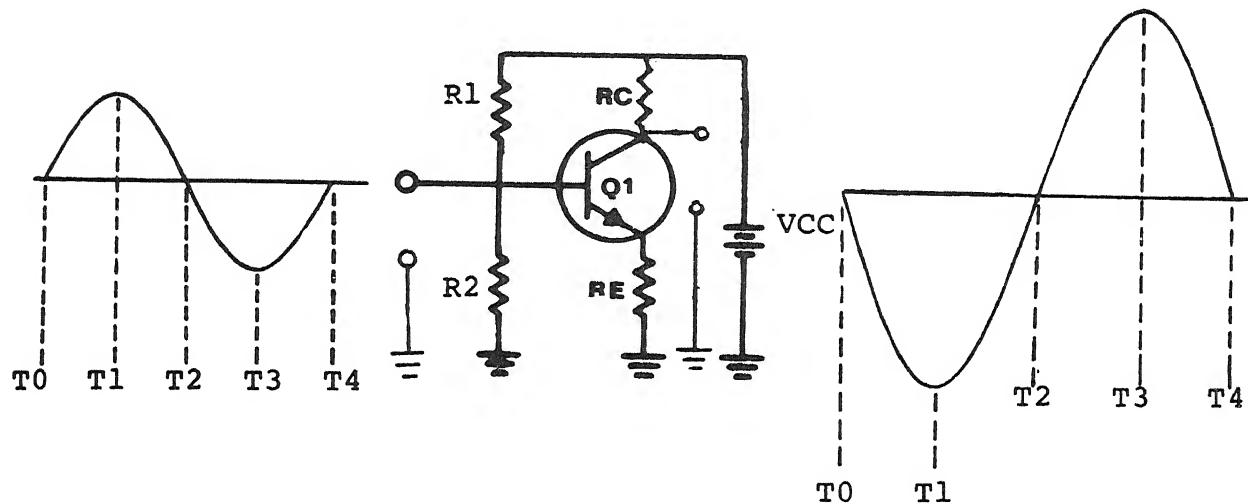
d.



e.



12. Select three effects that a sine wave input signal has on the operation of the transistor amplifier circuit shown below.



a. From T1 to T2, current flow increases.  
 b. From T1 to T2, current flow decreases.  
 c. From T1 to T2, V<sub>RC</sub> increases.  
 d. From T1 to T2, V<sub>RC</sub> decreases.  
 e. From T1 to T2, output voltage increases.

13. Match each class of bias listed below with the degree of collector current flow in relation to the input signal.

<input type="checkbox"/> a. Class A.	1. $180^\circ$
<input type="checkbox"/> b. Class AB.	2. $360^\circ$
<input type="checkbox"/> c. Class B.	3. Less than $180^\circ$
<input type="checkbox"/> d. Class C.	4. $0^\circ$
	5. Less than $360^\circ$ , but more than $180^\circ$

## LESSON TOPIC PROGRESS CHECK GUIDE

## TRANSISTORS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE (S)</u>	<u>P.I. FRAME (S)</u>
1. b	111	22
2. a c	111 111	16 16
3. b	112	25
4. a 2 b 1 c 3	114 114 114	29 29 29
5. e	115	32
6. a c d	116 116 116	36 36 36
7. a	116	40
8. b	118	44
9. a 4 b 2 c 3	120 120 121	53 53 53
10. a c d	121 121 121	57 57 57
11. c	123	63
12. b d e	126 126 126	68 68 68
13. a 2 b 5 c 1 d 3	130 130 130 130	76 76 76 76

## LESSON TOPIC PROGRESS CHECK

## BASIC AMPLIFIERS AND COUPLING CIRCUITS

## Lesson Topic Learning Objectives:

1. Given a list of transistor circuit configurations and a group of schematic drawings, match each configuration to the appropriate schematic.
2. Given a list of transistor circuit configurations and a list of identifying characteristics, match each configuration to the proper identifying characteristic.
3. Select, from a list of statements, the effects that a sine wave input has on the operation of a common-emitter circuit configuration.
4. Select, from a list of statements, the effects that a sine wave input has on the operation of a common-base circuit configuration.
5. Select, from a list of statements, the effects that a sine wave input has on the operation of a common-collector circuit configuration.
6. Given a simplified schematic drawing and a list of component combinations, select the combination which forms a RC coupling network.
7. Given a list of transformer coupling circuits and a group of schematic symbols, match each coupling circuit to the correct symbol.
8. Given a list of coupling methods and a list of applications, match each method to its most common application.

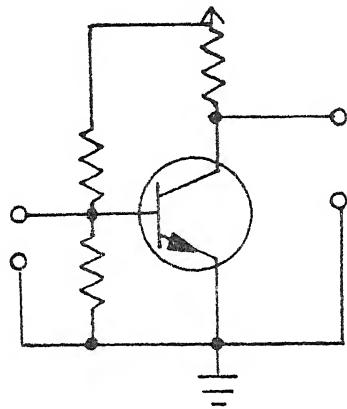
1. Match each amplifier configuration listed below to the appropriate schematic.

a. Common emitter.

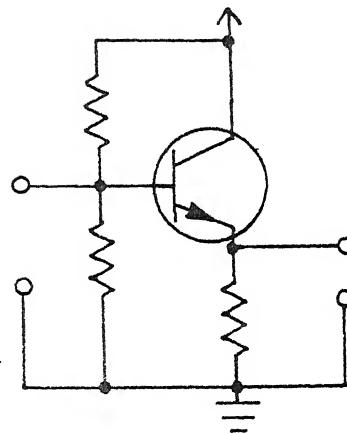
b. Common base.

c. Common collector.

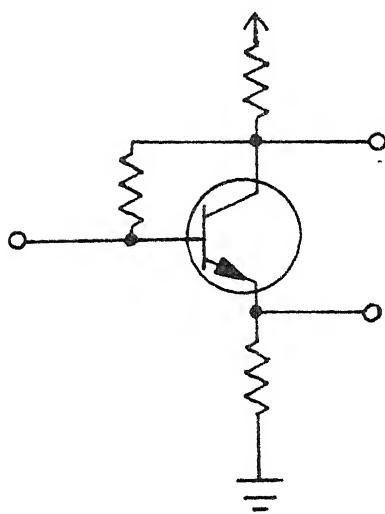
1.



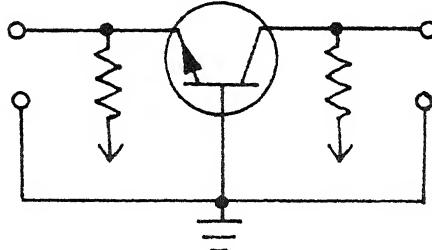
2.



3.



4.

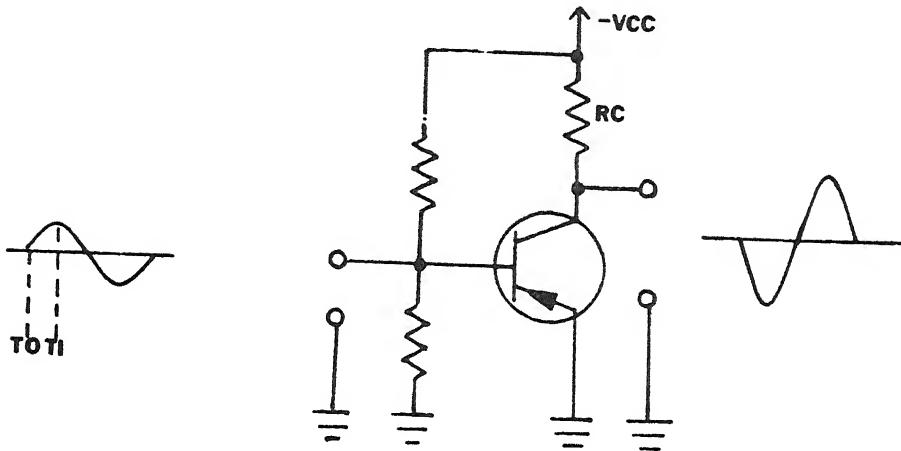


2. Match the three transistor configurations listed below to the proper identifying characteristics.

- a. Common emitter.
- b. Common base.
- c. Common collector.

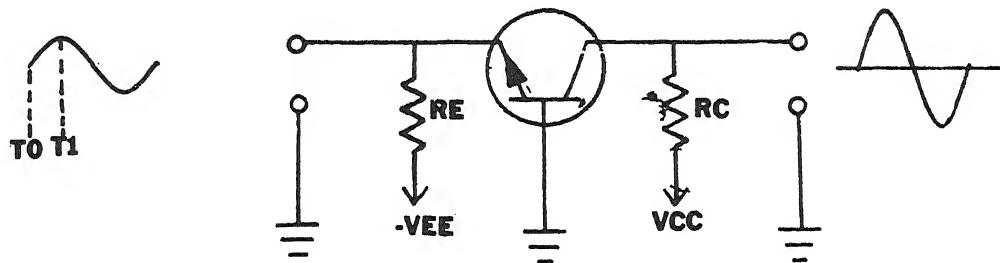
- 1. Input signal to emitter;  
output signal from base.
- 2. Input signal to collector;  
output signal from emitter.
- 3. Input signal to base;  
output signal from emitter.
- 4. Input signal to emitter;  
output signal from collector.
- 5. Input signal to base;  
output signal from collector.

3. In the common emitter PNP transistor amplifier circuit shown, when the input signal swings positive ( $T_0 - T_1$ ),



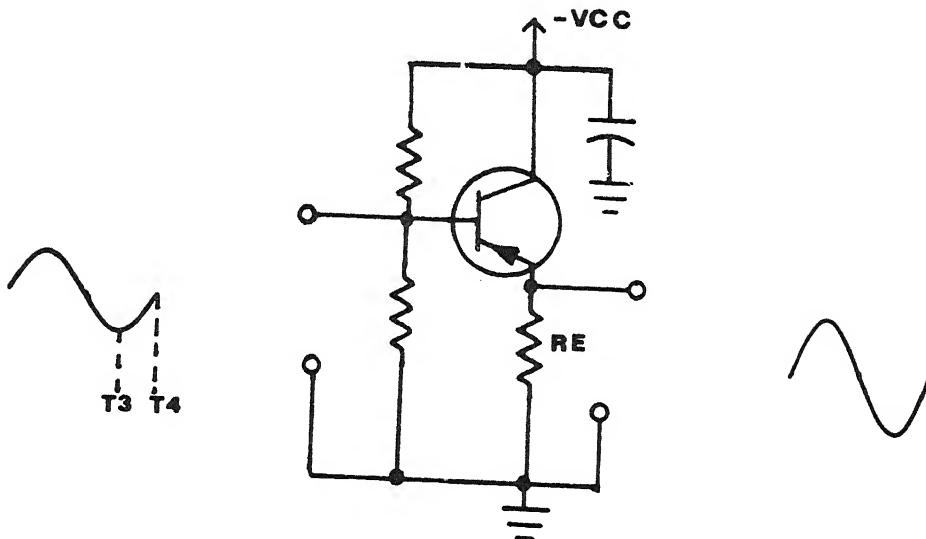
- a. current flow through Q1 decreases; V<sub>RC</sub> increases, V<sub>C</sub> decreases, and the output signal goes in the negative direction.
- b. current flow through Q1 increases; V<sub>RC</sub> increases, V<sub>C</sub> decreases, and the output signal goes in the negative direction.
- c. current flow through Q1 decreases; V<sub>RC</sub> decreases, V<sub>C</sub> increases, and the output signal goes in the negative direction.
- d. current flow through Q1 increases; V<sub>RC</sub> decreases, V<sub>C</sub> increases, and the output signal goes in the negative direction.

4. In the common base circuit illustrated below, when the input signal swings positive (T0 - T1);



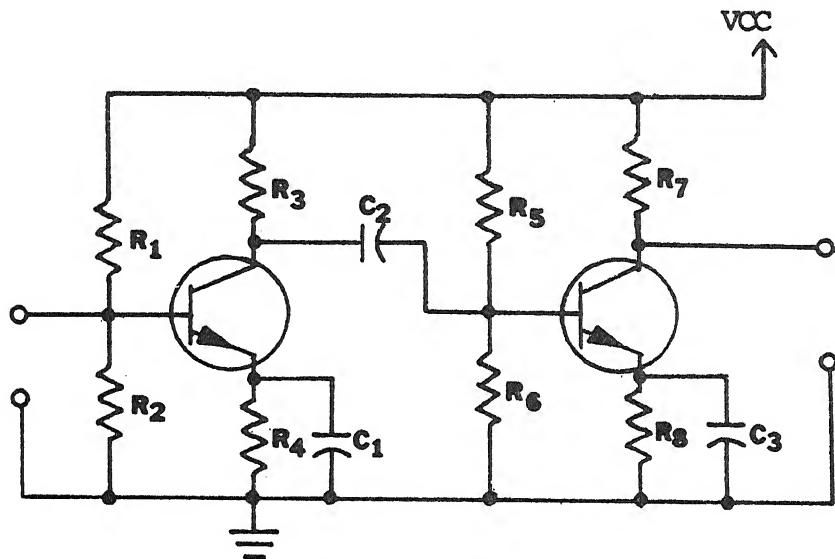
- a. current flow through Q1 increases, VRC decreases, VC increases, and the output signal goes in the positive direction.
- b. current flow through Q1 decreases, VRC increases, VC decreases, and the output signal goes in the positive direction.
- c. current flow through Q1 increases, VRC decreases, VC decreases, and the output signal goes in the positive direction.
- d. current flow through Q1 decreases, VRC decreases, VC increases, and the output signal goes in the positive direction.

5. In the common collector circuit illustrated below, when the input signal goes from T3 to T4;



- a. current flow through Q1 increases, VRE increases and the output signal decreases in amplitude from its positive peak.
- b. current flow through Q1 decreases, VRE decreases, and the output signal decreases in amplitude from its negative peak.
- c. current flow through Q1 increases, VRE increases, and the output signal rises in amplitude to its positive peak.
- d. current flow through Q1 decreases, VRE decreases, and the output signal rises in amplitude to its negative peak.

6. Select the combination of components that form an RC coupling network in the circuit illustrated below.

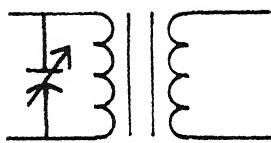


- a . R4, C1
- b . R5, C2
- c . R8, C3
- d . R3, C2
- e . R6, C2

7. Match each coupling circuit to the correct symbol.

- a. Untuned.
- b. Single tuned.
- c. Double tuned.

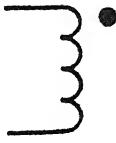
1.



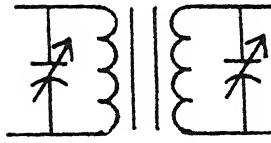
2.



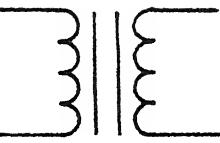
3.



4.



5.



8. Match the following coupling circuits to their most common application.

<input type="checkbox"/> a. RC coupling.	1. Very low frequency coupling.
<input type="checkbox"/> b. Transformer.	2. Low to medium frequency coupling.
<input type="checkbox"/> c. Direct.	3. Low to high frequency coupling.
	4. Very high frequency coupling.

LESSON TOPIC PROGRESS CHECK GUIDE  
BASIC AMPLIFIERS AND COUPLING CIRCUITSTEST ITEMSPRESCRIPTIVE STUDY GUIDEANSWERS

	<u>NARRATIVE</u> <u>PAGES</u>	<u>P.I.</u> <u>FRAME (S)</u>
1. a 1	69	1
b 4	70	1
c 2	71	1
2. a 5	69	1
b 4	69	1
c 3	71	1
3. c	76	4
4. d	82	9
5. b	86	14
6. e	88	18
7. a 5	90	22
b 1	90	22
c 4	90	22
8. a 2	93	26
b 3	93	26
c 1	93	26

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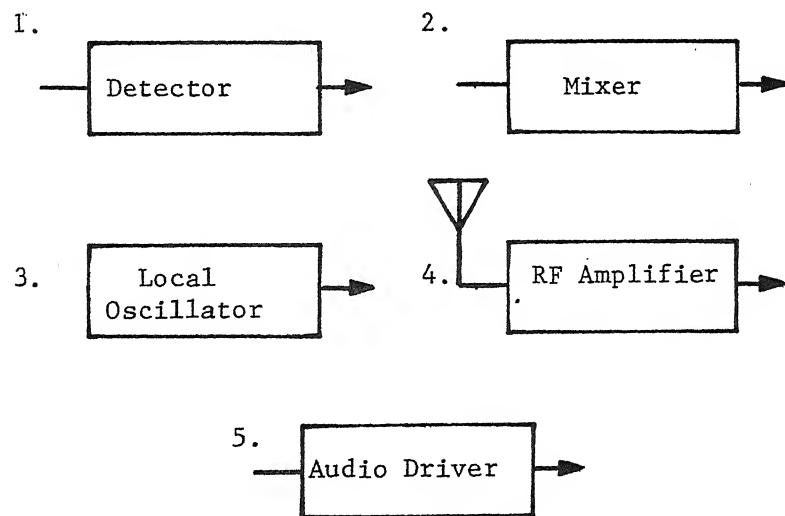
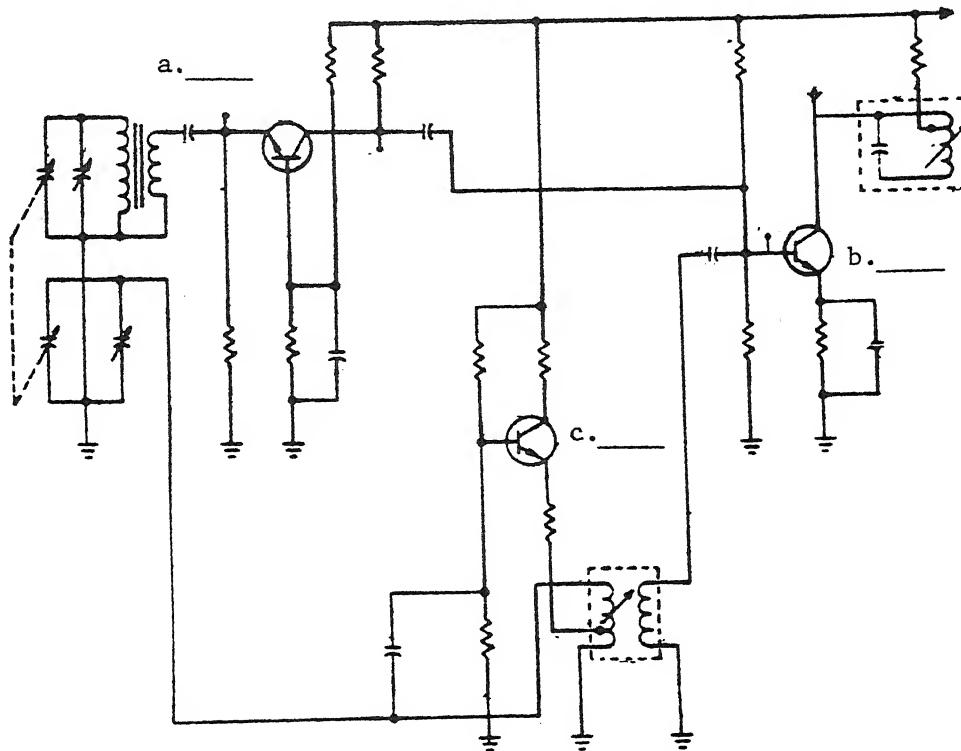
## LESSON TOPIC PROGRESS CHECK

## SIGNAL FLOW THROUGH THE AM RECEIVER

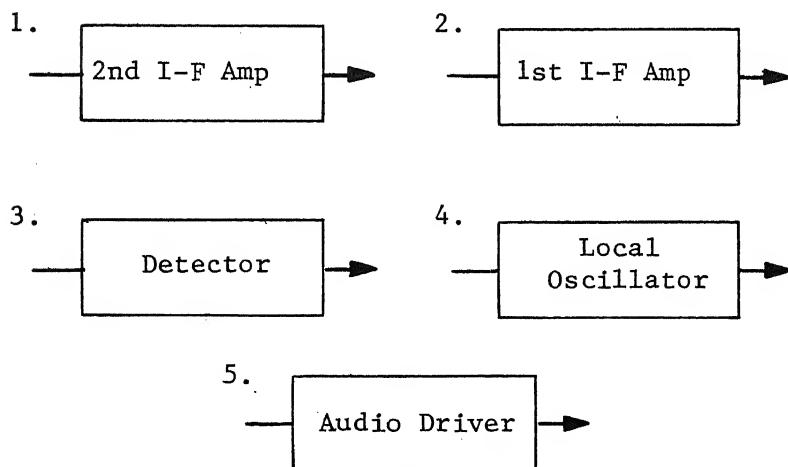
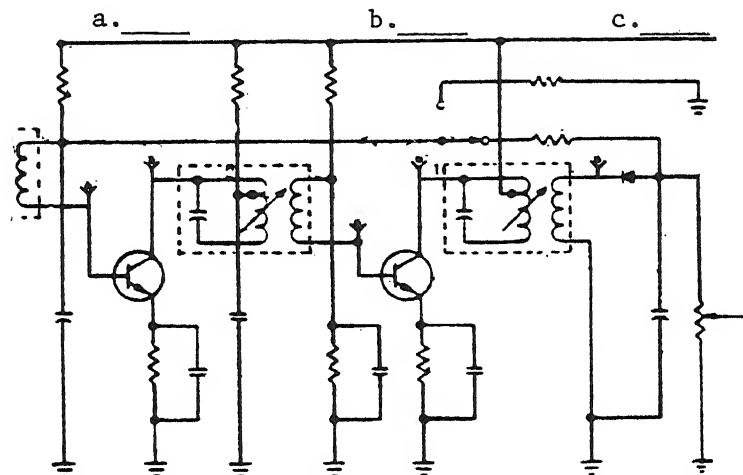
## Lesson Topic Learning Objectives:

1. Given a group of schematic drawings illustrating typical circuits and a group of blocks representing stages in a typical receiver, match each schematic to the appropriate block.
2. Given a schematic of an AM receiver, a list of electrical points selected from the schematic, and a group of drawings representing signals, match each signal to the point where it may be observed.
3. Select, from a list, the type of coupling used between specified circuits on a schematic diagram of an AM receiver.
4. Select, from a list, the function of a voltage regulator.
5. Given a group of schematic symbols and a list of components, match each symbol to the component it represents.
6. Select, from a list, the purpose of a parts placement diagram.

1. Match the illustrated circuits to the correct block from the block diagram of the AM receiver.



2. Match the designated circuits to the correct block from the block diagram of the AM receiver.



3. Refer to the AM receiver schematic diagram. Match the illustrated signals with the point at which they can be observed.

\_\_\_\_ a.



1. TJ2

\_\_\_\_ b.



2. Pin 4, T5

3. Anode of CR1

\_\_\_\_ c.



4. Emitter of Q1 (TP5)

5. Pin 1, T2

4. Refer to the AM receiver schematic diagram. What type of coupling is used between Q4 and Q5?

- a. Impedance
- b. RC
- c. Direct
- d. Tuned transformer
- e. Untuned transformer

5. Refer to the AM receiver schematic diagram. What type of coupling is used between the detector (CR1) and the audio driver (Q6)?
  - a. Direct
  - b. Transformer
  - c. Capacitance
  - d. RC
  - e. Impedance
6. Select the function of a voltage regulator.
  - a. Regulates current at a constant level regardless of voltage.
  - b. Prevents short circuiting of the power supply.
  - c. Maintains voltage at a constant level regardless of changes in input voltage or load current.
  - d. Maintains the oscillations of the local oscillator at a constant frequency regardless of changes in power supply output voltage.
  - e. Regulates voltage at a constant level regardless of changes in input frequency due to loading.

7. Match each symbol to the component it represents.



1. Magnetic shield



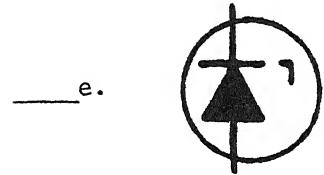
2. Antenna  
3. Audio jack



4. Mechanical linkage  
5. Power plug



6. Zener diode



8. Select the purpose of a parts placement diagram.

- a. Illustrate the physical location of components in the equipment.
- b. Show placement of components on the schematic diagram.
- c. Show part numbers of major components.
- d. Provide a cutaway view of components.
- e. Illustrate signal flow through the equipment.

## LESSON TOPIC PROGRESS CHECK GUIDE

## SIGNAL FLOW THROUGH THE AM RECEIVER

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. a 4 b 2 c 3	72 76 74	1 3 2
2. a 2 b 1 c 3	77 77 78	5 5 6
3. a 4 b 5 c 1	72 73, 74 77	16 16 17
4. d	91	21
5. d	91	21
6. c	88	13
7. a 4 b 1 c 3 d 5 e 6	91 91 92 92 92	25 25 25 25 25
8. a	92	29

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LESSON TOPIC PROGRESS CHECK

SIGNAL TRACING/INJECTING THE AM RECEIVER

Lesson Topic Learning Objectives:

1. Given a schematic diagram of an AM receiver and a list of points on that schematic, select the points at which an audio signal should be injected for signal tracing.
2. Given a schematic diagram of an AM receiver and a list of points, select the point at which a specified modulated rf signal should be injected for signal tracing.

1. Refer to the AM receiver schematic diagram and select the points at which an audio signal should be injected for signal tracing.
  - a. Q6 collector (TP1).
  - b. Q6 base (TP2).
  - c. Pin 1 of T5 (TJ2).
  - d. Q5 base (TJ3).
  - e. Q4 base (TJ5).
2. Refer to the AM receiver schematic diagram and select the point at which a 455kHz modulated rf signal should be injected to check the operation of the detector.
  - a. Q6 collector (TP1).
  - b. Q6 base (TP2).
  - c. Pin 3 of T5 (TJ1).
  - d. Q5 base (TJ3).
  - e. Q1 collector (TP4)
3. Refer to the AM receiver schematic diagram and select the points where a 455kHz modulated rf signal is injected to check the stage.
  - a. Q1 emitter (TP5).
  - b. Q1 collector (TP4).
  - c. Q4 base (TJ5).
  - d. Q6 collector (TP1).
  - e. Q5 base (TJ3).

4. Refer to the AM receiver schematic diagram and select the point at which a 1200kHz modulated rf signal should be injected to check the local oscillator.

- a. Q6 base (TP2).
- b. Pin 1 of T5 (TJ2).
- c. Q1 collector (TP4).
- d. Q2 base.
- e. Q4 base (TJ5).

## LESSON TOPIC PROGRESS CHECK GUIDE

## SIGNAL TRACING/INJECTING THE AM RECEIVER

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. a, b	23, 24	2, 3
2. c	24	5
3. c, e	24	8
4. c	25	17

LESSON TOPIC PROGRESS CHECK  
HANDBOOK OF SERVICE INSTRUCTIONS

Lesson Topic Learning Objectives:

1. Select, from a given list, the statement that correctly describes the purpose of the Handbook of Service Instructions.
2. Given a list of section titles contained in a typical HSI and a list of statements concerning the information contained in each section, match each section title to the appropriate statement.
3. Given a Handbook of Service Instructions, a list of tables and diagrams, and a list of information contained in those tables and diagrams, match each table and diagram to the correct information.

1. Select the purpose of the Handbook of Service Instructions.
  - a. Allow the procurement of parts for existing equipment.
  - b. Suggest substitute types of equipment.
  - c. Provide instructions for alignment, preventive maintenance, troubleshooting, and repair of equipment.
  - d. Provide procedures for procurement of new equipment.
  - e. Provide lists for parts substitutions.
  
2. Match each HSI section title to the information contained in that section.

<input type="checkbox"/> a. Description and Leading Particulars.	1. Index of schematic diagrams.
<input type="checkbox"/> b. Test Equipment and Special Tools.	2. Detailed explanations of system functions.
<input type="checkbox"/> c. Preparation for Use and Reshipment.	3. Packaging for storage.
<input type="checkbox"/> d. Theory of Operation.	4. System capabilities and limitations.
	5. Required test equipment.
  
3. Match each HSI section title to the information contained in that section.

<input type="checkbox"/> a. Organizational Maintenance.	1. Alignment procedures.
<input type="checkbox"/> b. Field Maintenance.	2. Minor repairs and adjustments.
<input type="checkbox"/> c. Schematic Diagrams.	3. Index of schematic diagrams.
<input type="checkbox"/> d. Difference Data Sheets.	4. System functions.
	5. Modifications to equipment.

4. Refer to the HSI for the 8D27. Match each chart/table listed below to the information it contains.

       a. Table I.                    1. Lists all the transistors and diodes used in the 8D27.  
       b. Table III.                2. Lists all equipment supplied with the 8D27.  
       c. Table V.                3. Lists all the modules in the 8D27 and gives their purpose.  
                                  4. Lists all the controls on the 8D27 and gives their purpose.

## LESSON TOPIC PROGRESS CHECK GUIDE

## HANDBOOK OF SERVICE INSTRUCTIONS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE (s)</u>	<u>P.I. FRAME (s)</u>
1. c	22	1
2. a 4	22	3
b 5	22	4
c 3	22	5
d 2	23	6
3. a 2	23	9
b 1	23	10
c 3	24	11
d 5	24	12
4. a 2	25	20
b 4	25	20
c 1	25	20

LESSON TOPIC PROGRESS CHECK

OPERATION OF AN AIRBORNE COMMUNICATIONS SYSTEM

Lesson Topic Learning Objectives:

1. Select, from a list, the purpose of a dummy load.
2. From a list, select the function of the sidetone circuit in a communications transceiver.

1. Select the purpose of a dummy load.
  - a. Provide a means of checking receiver sensitivity without transmitting.
  - b. Provide a means of transmitting rf energy without an antenna.
  - c. Prevent damage to a transmitter due to excessive radiated energy.
  - d. Provide a means of checking transmitter output power without radiating rf energy into space.
  - e. Prevent nearby transmitters from interfering with a transmitter check.
2. Select the function of a sidetone circuit.
  - a. Provide the capability for two persons to monitor rf transmissions simultaneously.
  - b. Feed a portion of the transmitter signal back to the operator's headset to allow the operator to hear himself speak.
  - c. Sample the received signal and provide audio to the operator's headset.
  - d. Sample the transmitter output signal and provide current to the power output meter.
  - e. Filter out unmodulated rf signals from the transmitter.

## LESSON TOPIC PROGRESS CHECK GUIDE

## OPERATION OF AN AIRBORNE COMMUNICATIONS SYSTEM

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(s)</u>	<u>P.I. FRAME(s)</u>
1. d	10	1
2. b	10	3

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## LESSON TOPIC PROGRESS CHECK

## OBTAINING SUPPLY DATA AND ORDERING PARTS USING THE VIDS/MAF

## Lesson Topic Learning Objectives:

1. Select, from a list, the information contained in the Numerical Index of an Illustrated Parts Breakdown.
2. Select, from a list, the information contained in the Reference Designation Index of an Illustrated Parts Breakdown.
3. Select, from a list, the information contained in the Group Assembly Parts List of an Illustrated Parts Breakdown.
4. Select, from a list, the information contained in the Index of a QR Manual.
5. Given a list of blocks on a VIDS/MAF, select those that are used to requisition parts.
6. Given a list of organizational maintenance work centers, select the work center where all parts are turned in and picked up.
7. Select, from a list, the item(s) that must accompany a part that is turned in for repair.

1. Select the information provided in the Numerical Index of an IPB.
  - a. Cross reference from part number to figure and index number.
  - b. Part number, quantity per assembly, and source code.
  - c. Cross reference from part number to figure and index number, source code, repair code, and manufacturer's code.
  - d. Source code, quantity per assembly, figure and index number, part number, and cost.
  - e. Cross reference from figure and index number to part number, source code, and units per assembly.
2. Select the information provided in the Reference Designation Index of an IPB.
  - a. Cross reference from reference designation to figure and cost.
  - b. Cross reference from index number to reference designation.
  - c. Cross reference from reference designation to figure and index number and part number.
  - d. Cross reference from figure and index number to reference designation and repair code.
  - e. Reference designation, quantity per assembly, and SM&R code.
3. Select the information contained in the Group Assembly Parts List of an IPB.
  - a. Units per assembly, description, part number, and cost.
  - b. Figure and index number, part number, description, units per assembly.
  - c. Figure and index number, manufacturer's code, use on code, and description.
  - d. Units per assembly, use on code, part number, and reference designation.
  - e. Manufacturer's code, figure and index number, reference designation, and cost.

4. Select the information contained in the index of a QR Manual.
  - a. Cross reference from reference symbol and/or NIIN to an item number.
  - b. Cross reference from part number to NIIN.
  - c. Cross reference from part number to page number.
  - d. Cross reference from reference symbol to NIIN.
  - e. Cross reference from manufacturer's code to item number.
5. Select the blocks of a VIDS/MAF which are used to requisition parts.
  - a. Blocks 45, 49, 53.
  - b. Blocks 11, 19, 24.
  - c. Blocks A29, A32, A34.
  - d. Blocks 14, 19, 41.
  - e. Blocks 19, 41, 24.
6. Select the work center where all parts are turned in and picked up.
  - a. Corrosion Control.
  - b. Repair.
  - c. Maintenance Control.
  - d. Material Duty Office.
  - e. Material Control.
7. Select the item that must accompany a part that is turned in for repair.
  - a. All copies of the original VIDS/MAF.
  - b. An additional five part VIDS/MAF initiated by the work center.
  - c. Any two copies of the VIDS/MAF.
  - d. The first two copies of the VIDS/MAF.
  - e. The Aircraft Discrepancy Logbook.

## LESSON TOPIC PROGRESS CHECK GUIDE

## OBTAINING SUPPLY DATA AND ORDERING PARTS USING THE VIDS/MAF

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. a	31	3
2. c	31,32	6
3. b	30	1
4. a	32,33	10
5. d	33	14
6. e	35	18
7. b	35	22

LESSON TOPIC PROGRESS CHECK

TROUBLESHOOTING THE AIRBORNE AM COMMUNICATIONS SYSTEM TO A UNIT

Lesson Topic Learning Objectives:

1. Select, from a list of statements, the purpose of a troubleshooting matrix diagram.
2. Given a list, select the statements that describe the symbols used on a troubleshooting matrix diagram.
3. Given indications and a troubleshooting matrix diagram for an airborne AM communications system trainer, select the next appropriate step to be taken in troubleshooting.

1. Select the statements below that describe the purpose of a troubleshooting matrix diagram.
  - a. A troubleshooting matrix provides a diagnostic procedure used for testing equipment.
  - b. A troubleshooting matrix outlines the theory of operation for a piece of equipment.
  - c. A troubleshooting matrix provides a  $\pm 20$  tolerance for all tests/checks.
  - d. A troubleshooting matrix provides a logical flow of tests and checks to be made.
  - e. A troubleshooting matrix provides a basic theory of operation to help the technician to understand how the equipment operates.
2. Select the statements that describe the symbols used on a troubleshooting matrix diagram.
  - a. Rectangular blocks are decision blocks.
  - b. Diamond blocks are information blocks for test and checks.
  - c. Rectangular blocks are information blocks for test and checks.
  - d. Diamond blocks are decision blocks.
  - e. Rectangular blocks are theory blocks.
3. An AM communications system has no sidetone and the microphone has proven good. What is the next step to be taken in troubleshooting the system?
  - a. Check microphone input jack.
  - b. Verify communications with control.
  - c. Check transceiver by replacing with a known good unit.
  - d. Check headset by replacing with a known good unit.
  - e. Check the fuses in the power supply.

4. An AM communications system has sidetone on the initial check, but there is no answer from the control desk on the communications check. Which unit should be checked?

- a. Check antenna by replacing with a known good unit.
- b. Check transceiver by replacing with a known good unit.
- c. Replace headset with a known good unit.
- d. Replace microphone with a known good unit.
- e. Check transmitter switch.

## LESSON TOPIC PROGRESS CHECK GUIDE

## TROUBLESHOOTING THE AIRBORNE AM COMMUNICATIONS SYSTEM TO A UNIT

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE (s)</u>	<u>P.I. FRAME (s)</u>
1. a, d	15	1
2. c, d	15	3
3. d	17	7
4. b	17	7

## LESSON TOPIC PROGRESS CHECK

## TRANSCEIVER UNIT BLOCK DIAGRAM

## Lesson Topic Learning Objectives:

1. Select, from a list of statements, the reason for constructing circuits on modules/printed circuit boards.
2. Select, from a list of statements, the function of test jacks.
3. Given a group of electronic symbols representing signal paths on a block diagram and a list of signal path names, match each name to the appropriate symbol.
4. Given a list of modules on the functional block diagram of a transceiver unit and a list of electronic functions, match each module to the function it performs.
5. Given a list of modules on a functional block diagram of an airborne AM transceiver trainer and a group of illustrations representing input and output signals, match each module to the appropriate illustration.

## LESSON TOPIC PROGRESS CHECK

(SELF-TEST)

## AIRBORNE AM TRANSCEIVER BLOCK DIAGRAM

1. Select the statement describing the reason for constructing circuits on modules printed circuit boards.
  - a. Organize equipment into a series of interconnected, removable subassemblies.
  - b. Build an entire piece of equipment on one main circuit board.
  - c. Organize all test points logically on a common circuit board.
  - d. Completely eliminate wiring in a circuit.
  - e. Allow all individual parts on a circuit board to be removable.
2. Select the statement that describes the function of test jacks.
  - a. To provide a point in the circuit where the equipment characteristics can be conveniently varied.
  - b. To allow the equipment to be disabled without turning it off.
  - c. To provide a convenient point in a circuit where test equipment probes may be inserted to observe/measure waveforms or other electrical quantities.
  - d. To adjust the power input or other electrical quantities of a system to an efficient level.
  - e. Allows the mixing of two signals for experimental changes.

3. Match each symbol to the name of the signal path it represents.

- a. 
- b. 
- c. 

- 1. Transmitter signal path.
- 2. Power supply signal path.
- 3. Receiver signal path.
- 4. Oscillator signal path.
- 5. Alignment signal path.

4. Match each module to its electronic function.

- a. Power supply and voltage regulator.
- b. Rf amplifier.
- c. First i-f amplifier.

- 1. Amplifies the rf signal from the antenna or amplifies the second transmitter mixer signal.
- 2. Provides a frequency input to the first transmitter mixer.
- 3. Supplies all required voltages for transceiver operation.
- 4. Provides a basic rf signal to the doubler and amplifier module.
- 5. Amplifies the i-f signal from the first receiver mixer or the output of the first transmitter mixer and oscillator module.

5. Match each module/stage to its electronic function.

<ul style="list-style-type: none"><li><u>      </u> a. Low frequency oscillator.</li><li><u>      </u> b. High frequency oscillator.</li><li><u>      </u> c. Doubler and amplifier.</li></ul>	<ul style="list-style-type: none"><li>1. Generates the basic audio signal used for modulation.</li><li>2. Doubles the output frequency of the high frequency oscillator and provides an input to the first receiver mixer or second transmitter mixer.</li><li>3. Provides final amplification of the rf signal to be transmitted.</li><li>4. Provides a basic rf signal to the doubler and amplifier module.</li><li>5. Generates the basic rf signal for the transmitter and provides the local oscillator signal to the second receiver mixer.</li></ul>
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6. Match each module to its electronic function.

<ul style="list-style-type: none"><li><u>      </u> a. First transmitter mixer and oscillator.</li><li><u>      </u> b. Second transmitter mixer and BFO.</li><li><u>      </u> c. Rf power amplifier.</li></ul>	<ul style="list-style-type: none"><li>1. Mixes signals from the doubler and amplifier and first i-f amplifier to produce the final transmitter frequency.</li><li>2. Provides final amplification of the rf carrier.</li><li>3. Generates the basic audio signal used for modulation.</li><li>4. Frequency modulates the second receiver mixer.</li><li>5. Heterodynes a 455 kHz oscillator signal with the low frequency oscillator signal.</li></ul>
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7. Match each module to its electronic function.

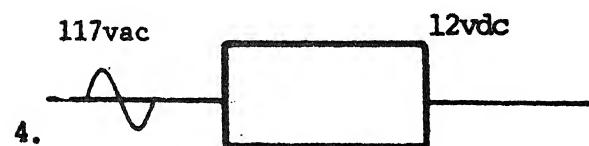
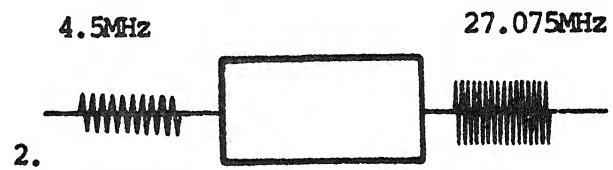
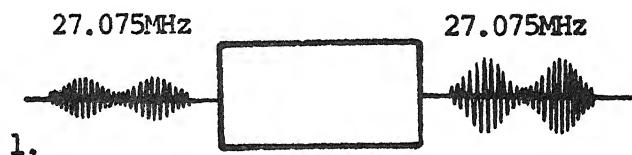
<u>  </u> a. Modulator.	1. Supplies the required audio power to modulate the carrier.
<u>  </u> b. Sidetone amplifier.	2. Amplifies detected audio to drive a headset.
	3. Amplifies the rf.

8. Match each module to its electronic function.

<u>  </u> a. First receiver mixer.	1. Provides the amplified second (low) i-f signal by heterodyning the signals from the first i-f amplifier and the low frequency oscillator.
<u>  </u> b. Second receiver mixer and i-f amplifier.	2. Provides the first (high) i-f by heterodyning the incoming rf signal with the signal from the doubler and amplifier.
<u>  </u> c. Detector/preamplifier.	3. Provides an i-f input to the doubler and amplifier for heterodyning.
<u>  </u> d. Audio output amplifier.	4. Samples the i-f signal and returns a portion of it to the rf amplifier.
	5. Recovers the audio intelligence from the AM waveform and amplifies the audio.
	6. Further amplifies audio to drive an output device.

9. Match each module to its input and output signals.

- a. Power supply and voltage regulator.
- b. Rf amplifier.
- c. First i-f amplifier.

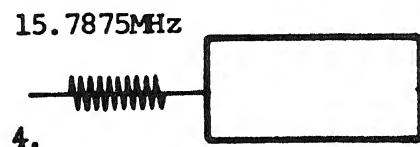
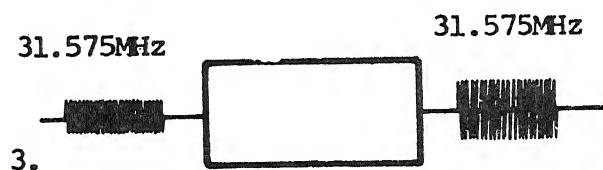
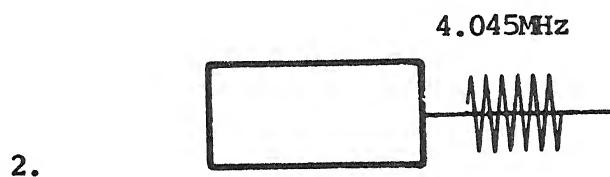
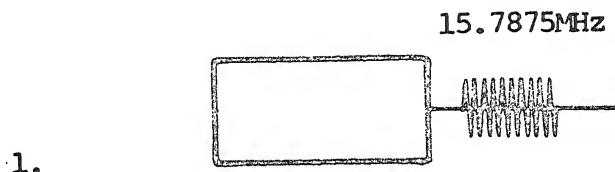


10. Match each module to its input and output signals.

   a. Low frequency oscillator.

   b. High frequency oscillator  
and VCO.

   c. Doubler and amplifier.

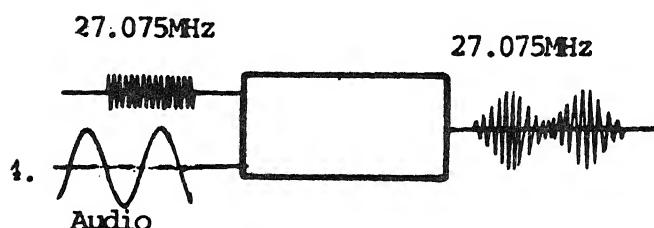
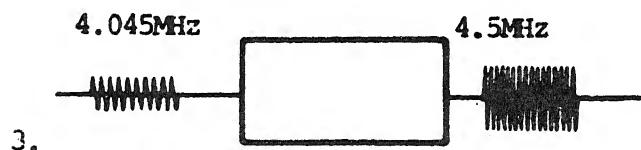
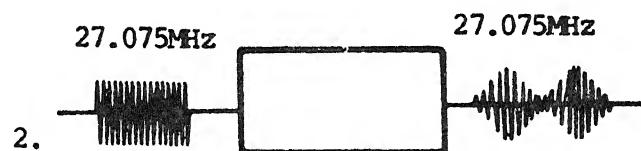
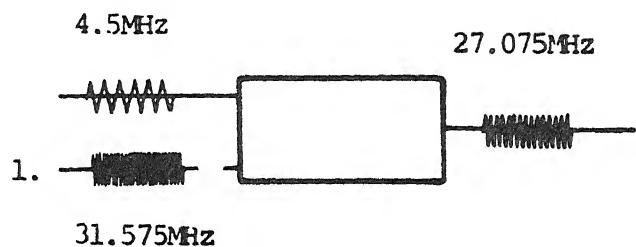


11. Match each module to its input and output signals.

a. First transmitter mixer  
and oscillator.

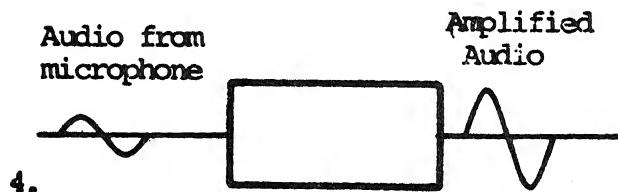
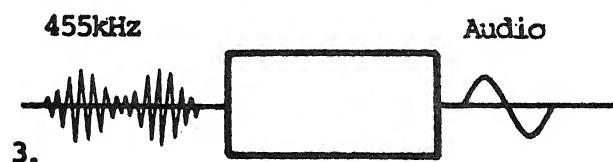
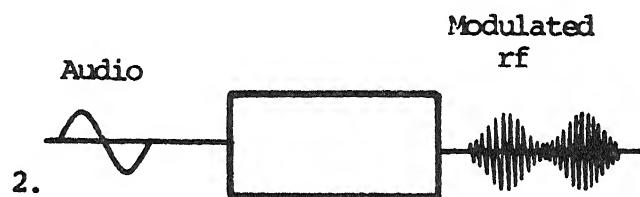
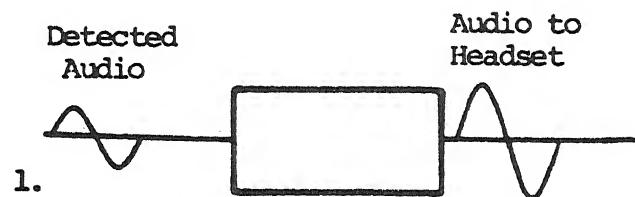
b. Second transmitter mixer  
and BFO.

c. Rf power amplifier.



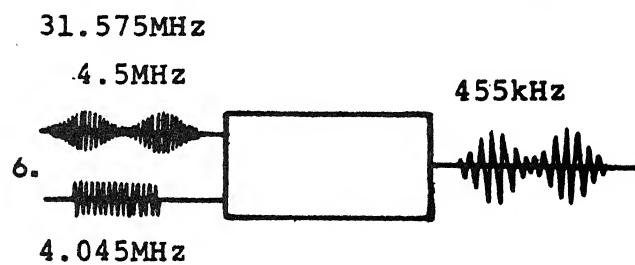
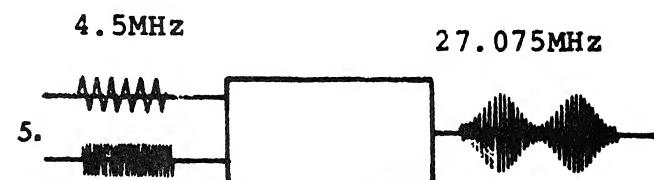
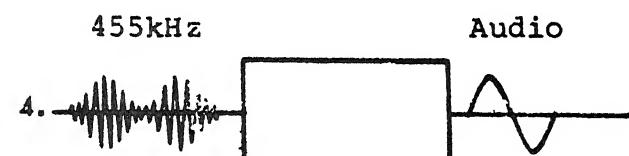
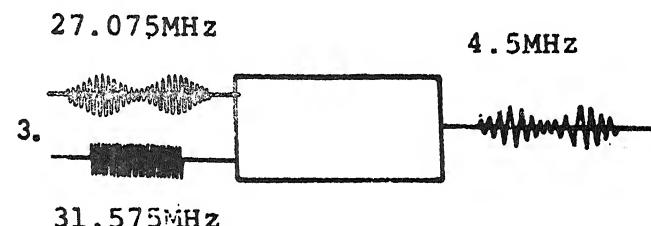
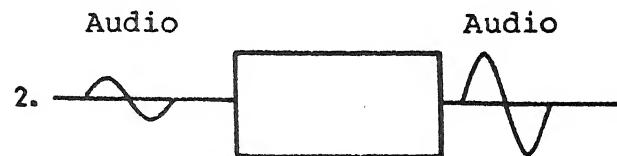
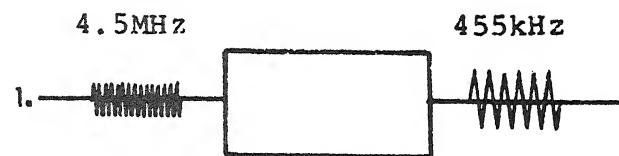
12. Match each module to its input and output signals.

a. Modulator.  
 b. Sidetone amplifier.



13. Match each module to its input and output signals.

- a. First receiver mixer.
- b. Second receiver mixer and i-f amplifier.
- c. Detector/preamplifier.
- d. Audio output amplifier.



LESSON TOPIC PROGRESS CHECK GUIDE

## TRANSCEIVER UNIT BLOCK DIAGRAM

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(s)</u>	<u>P.I. FRAME(s)</u>
1. a	79	1
2. c	79	3
3. a4 b3 c1	79 79 79	6 6 6
4. a3 b1 c5	80, 83, 91 80, 84 81, 84	26 27 28
5. a5 b4 c2	81, 85, 88 80, 82, 85 82, 85	32 33 33
6. a5 b1 c2	81 82 82	16 17 18
7. a1 b2	82, 91 83	22 22
8. a2 b1 c5 d6	80, 85 81, 88 81 81	10 11 12 12
9. a4 b1 c3	91 80, 84, 86 84, 87	64 40 44
10. .2 b1 c4	87 86 86	

ANSWERS11. a3  
b1  
c412. a4  
b113. a3  
b6  
c4  
d2NARRATIVE  
PAGE(s)90  
90  
9191  
8387  
88  
88  
89P.I.  
FRAME(s)54  
55  
5660  
6042  
46  
49  
50

LESSON TOPIC PROGRESS CHECK

CHASSIS WIRING DIAGRAMS

Lesson Topic Learning Objectives:

1. Given a list of chassis wire colors and a list of functions, match each color to the wire function as used in the airborne AM transceiver trainer.
2. Select, from a given list, the function of the shielded cable used in an airborne AM transceiver.
3. Given a list of electronic parts and a list of electrical functions, match each part to the function it performs.
4. Given a list of electronic parts and a group of electronic symbols, match each part to the correct symbol.

LESSON TOPIC PROGRESS CHECK  
(SELF-TEST)

## CHASSIS WIRING DIAGRAM

1. Match the wire color codes listed with their appropriate functions in the airborne AM transceiver trainer.

<input type="checkbox"/> a. Brown.	1. 12vdc receive.
<input type="checkbox"/> b. Red.	2. 12vdc transmit and receive.
<input type="checkbox"/> c. Black.	3. 12 vdc transmit.
	4. Chassis ground.
	5. A-c signal lines.
2. The function of the shielded cable used in the airborne AM transceiver is to
  - a. Distribute 12 vdc to the receiver modules.
  - b. Couple rf energy to chassis ground.
  - c. Couple rf and af energy from module to module.
  - d. Distribute 12 vdc to the transmitter modules.
  - e. Apply 117 vdc to the circuit modules.

3. Match each part from the parts list in column A with the statement that describes its function or purpose in column B.

A

- a. Audio jack.
- b. Indicator switch.
- c. Rf connector.

B

- 1. Couples af and rf energy from one point to another.
- 2. Provides a terminal point to which the antenna, test equipment and other rf components can be connected.
- 3. Provides for automatic power overload control.
- 4. Controls transceiver circuits and provides a visual display of their condition.
- 5. Provides a terminal point for connection of audio-signal devices.

4. Match each part from the parts list in column A with the statement that describes its function or purpose in column B.

A

- a. Rf connector.
- b. Selector switch.
- c. Microswitch.

B

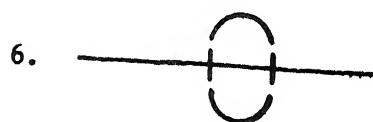
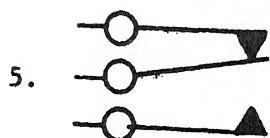
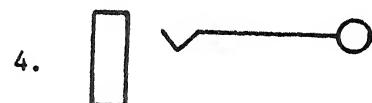
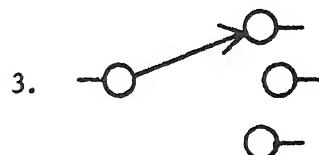
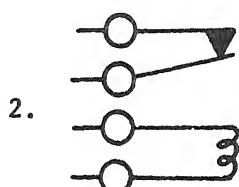
- 1. Provides a visual indication of circuit-operating conditions.
- 2. Provides for quick connect/disconnect of af and rf cables.
- 3. Couples af and rf energy from one circuit point to another.
- 4. Permits the selection of a variety of equipment functions.
- 5. Mechanically switches a function with a minimum of physical movement.

5. Match the given schematic symbols to parts in the parts list.

A

- a. Selector switch.
- b. Microswitch.
- c. Rf connector.
- d. Shielded cable.

B



## LESSON TOPIC PROGRESS GUIDE

## CHASSIS WIRING DIAGRAMS

TEST ITEMSANSWERSPRESCRIPTIVE STUDY GUIDENARRATIVE  
PAGE(S)      P.I.  
FRAME(S)

1. a2 b1 c4	41	2
2. e	41, 42, 43	4
3. a5 b4 c2	44 43 46	8 8 10
4. a2 b4 c5	47 45 46	10 9 9
5. a3 b5 c1 d6	45 46 46, 47 41, 42, 43	9 9 10 4

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LESSON TOPIC PROGRESS CHECK  
SIGNAL FLOW IN AN AM TRANSCEIVER

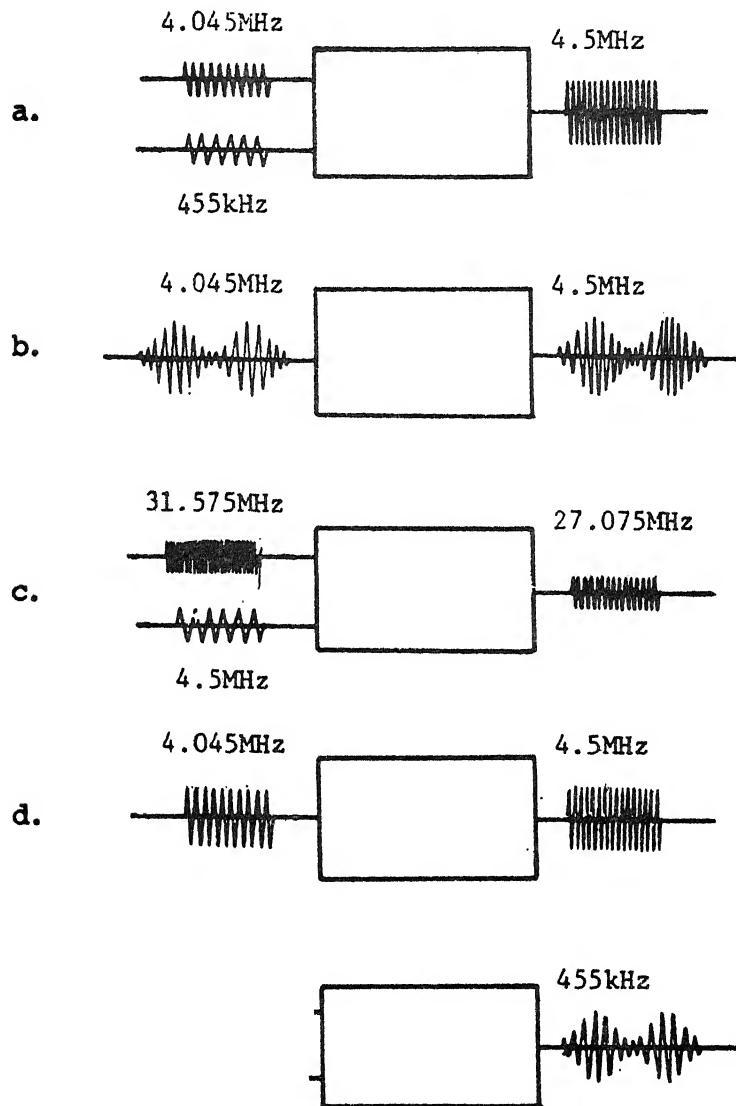
Lesson Topic Learning Objectives:

1. Select from groups of input/output signals, those signals that illustrate the signal relationships of specified modules in the transmitter section of the airborne AM transceiver trainer.
2. Select from given groups of input/output signals, those signals that illustrate the signal relationships of specified modules in the receiver section of the airborne AM transceiver trainer.
3. Select, from lists of frequencies, those that would be used for signal injection and/or signal tracing specified modules in the receiver section of the airborne AM transceiver trainer.

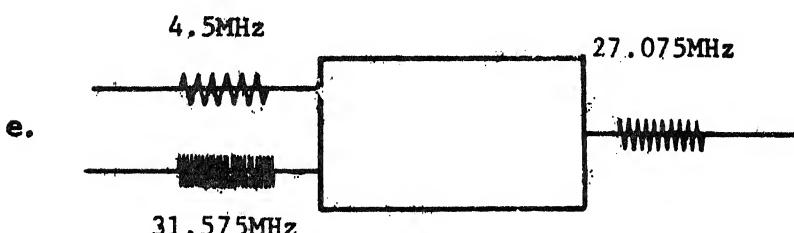
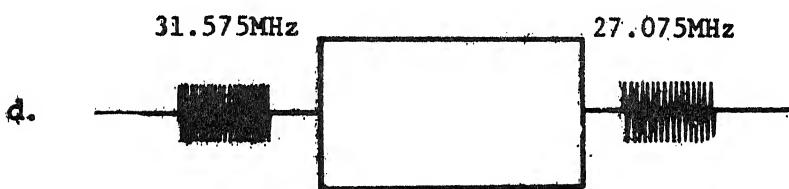
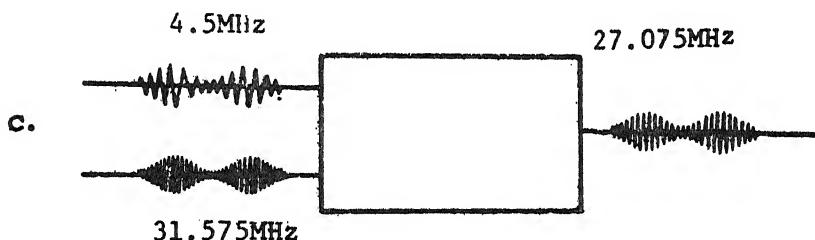
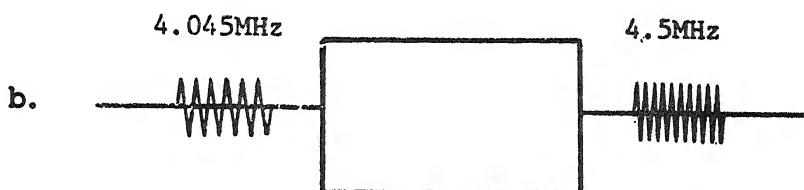
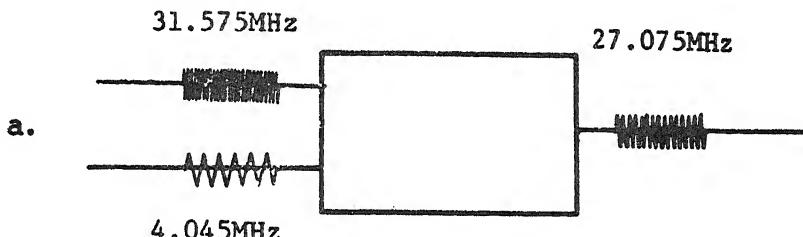
LESSON TOPIC PROGRESS CHECK  
(SELF TEST)

## SIGNAL FLOW IN AN AM TRANSCEIVER

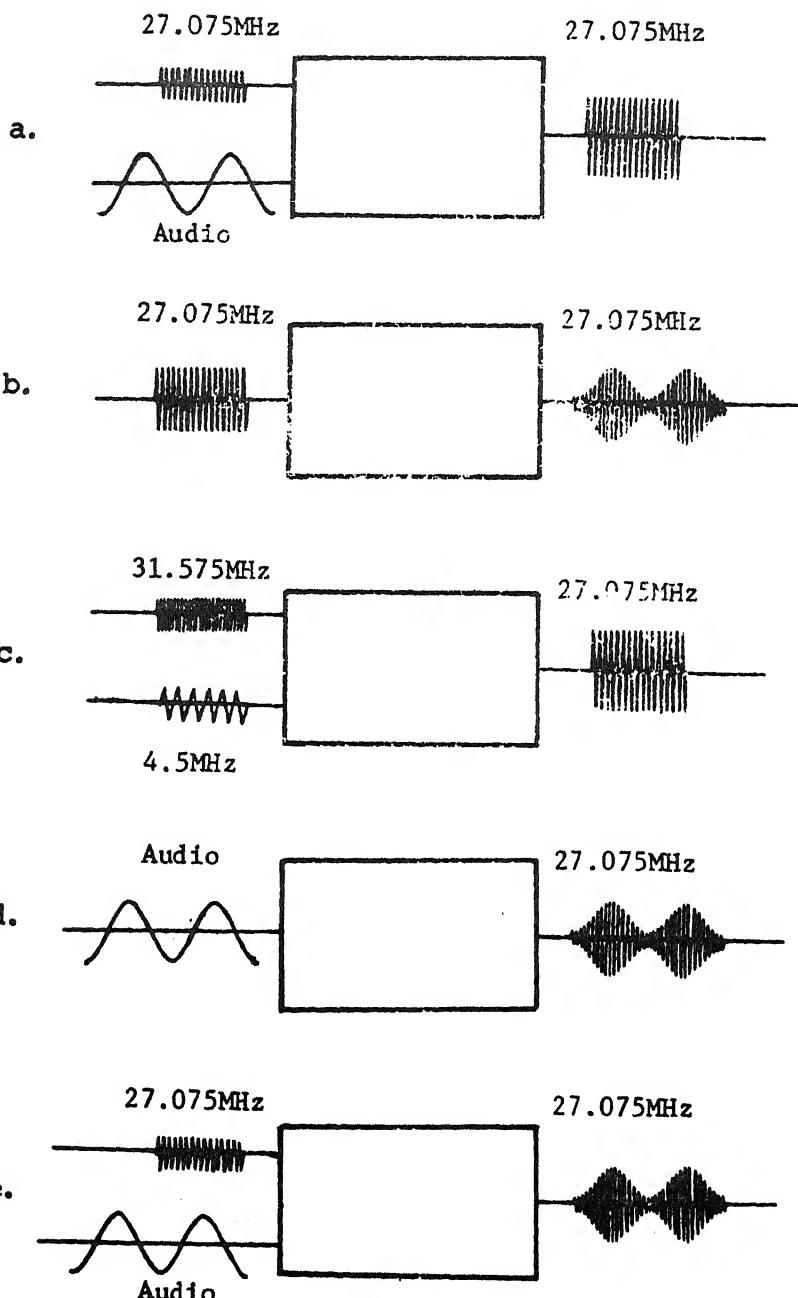
1. Which one of the following block diagrams identifies the signal relationships of the first Transmitter Mixer and Oscillator Module? (channel 2)



2. Which one of the following block diagrams identifies the signal relationships of the Second Transmitter Mixer and BFO module? (Channel 2)

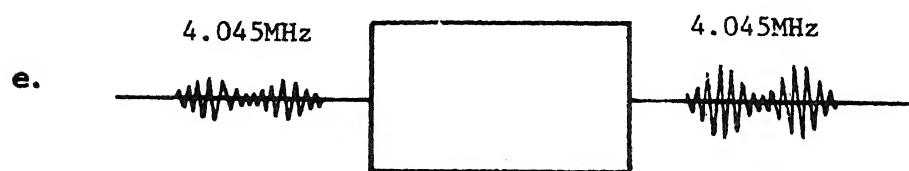
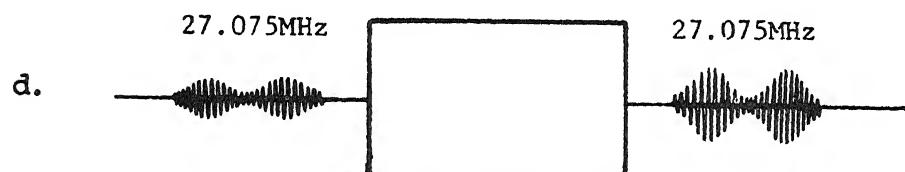
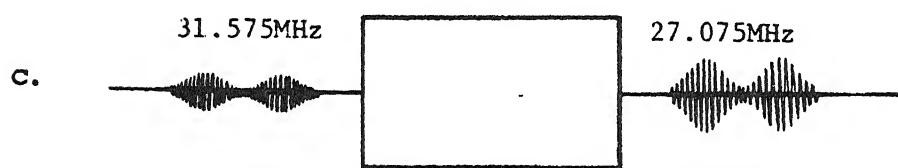
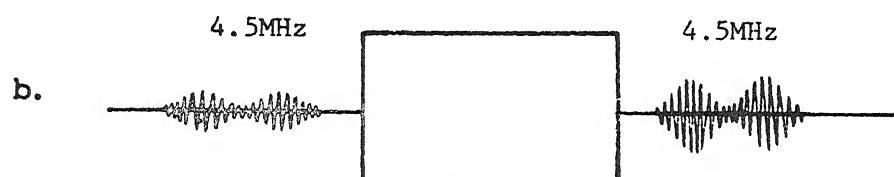
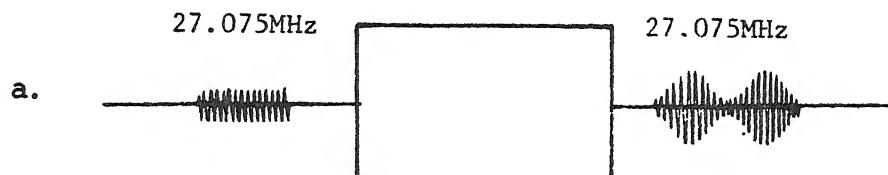


3. Which one of the following block diagrams identifies the signal relationships of the RF Power Amplifier Module?

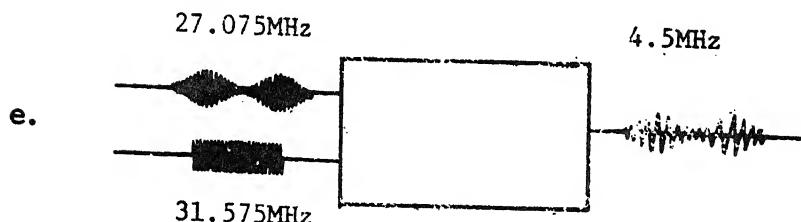
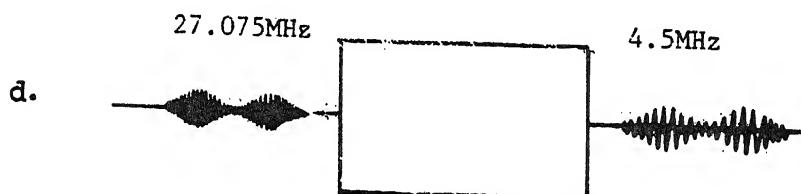
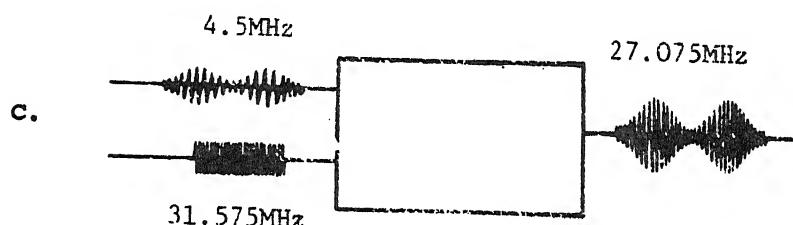
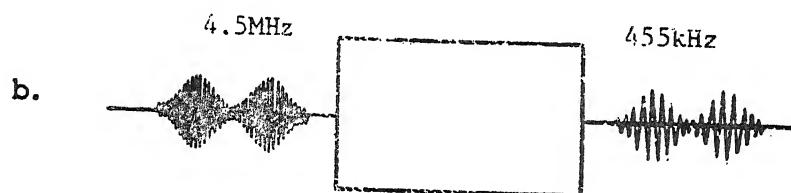
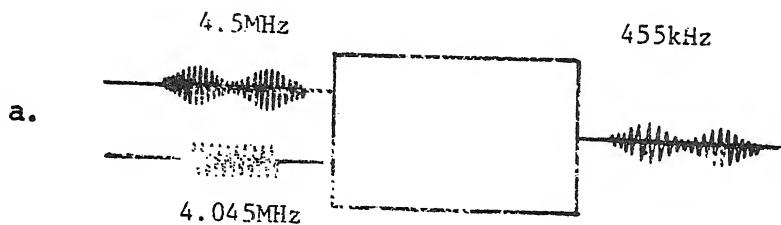


Module 1-2  
Lesson Topic 1-2-5

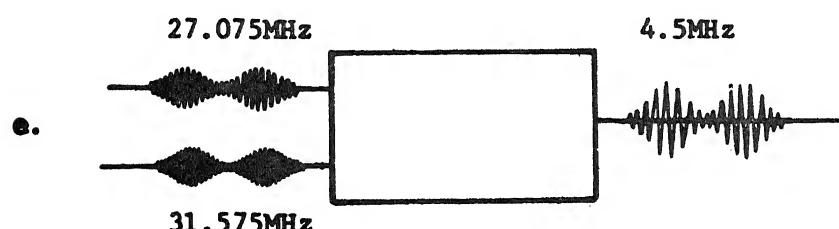
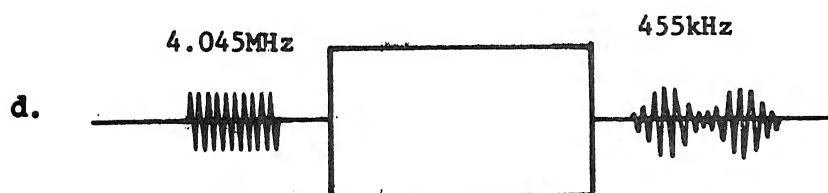
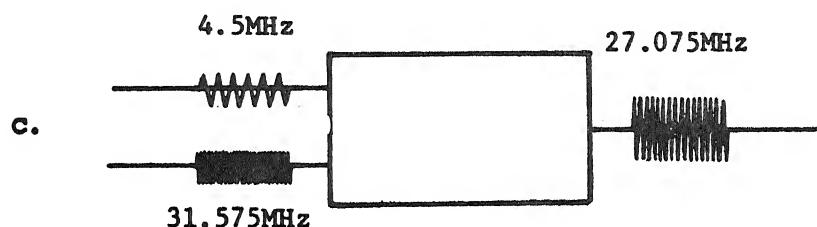
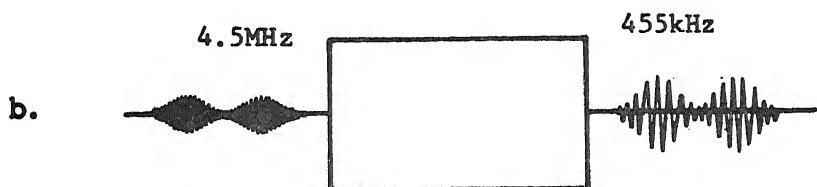
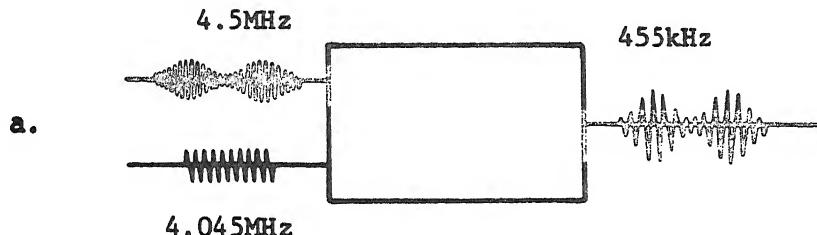
Which one of the following block diagrams identifies the signal relationships of the RF Amplifier Module?



5. Which one of the following block diagrams identifies the signal relationships of the First Receiver Mixer Module? (channel 2)



6. Which one of the following block diagrams identifies the signal relationships of the Second Receiver Mixer and i-f Amplifier module? (Channel 2)



7. What frequency should be injected at the input to the audio output amplifier to check its operation?
  - a. 4.5MHz, modulated 30% with 1000Hz.
  - b. 455kHz.
  - c. 1000Hz.
  - d. 27MHz, modulated 30% with 1000Hz.
  - e. 1000Hz, modulated 30%.
  
8. What frequency should be injected at the input to the second receiver mixer and i-f amplifier module to check its operation?
  - a. 1000Hz.
  - b. 4.5MHz, modulated 30% with 1000Hz. J9
  - c. 455kHz, modulated 30% with 1000Hz. J9
  - d. 27MHz, modulated 30% with 1000Hz. J9
  - e. 4.045MHz, modulated 30% with 1000Hz. J9

LESSON TOPIC PROGRESS GUIDE

SIGNAL FLOW IN AN AM TRANSCEIVER

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. d	44	1
2. e	45	2
3. e	45, 46	3
4. d	46	5
5. e	46	5
6. a	47	6
7. c	49	10
8. b	49	10

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## LESSON TOPIC PROGRESS CHECK

ISOLATING MALFUNCTIONING MODULES IN AN AM ~~COMMUNICATIONS~~  
TRANSCEIVER

## Lesson Topic Learning Objectives:

1. Select from a list of statements, the purpose of a test bench inspection for security.

## PROGRESS CHECK (Self-Test)

1. Select the purpose of a test bench inspection for security.
  - a. Checks for loose or improperly installed modules, connectors, or control knobs that could cause an equipment malfunction.
  - b. Checks that all necessary test equipment is on hand and working properly.
  - c. Insures that the equipment has the correct power supply voltage.
  - d. Insures that all publications pertaining to equipment on the bench are classified as per its security.
  - e. Prevents a loss of power to the equipment.
2. Select the statements that describe problems that may arise because of loose or improperly secured modules, cards, jacks, plugs, or knobs.
  - a. Transmitter power may decrease.
  - b. Transceiver operation may become intermittent.
  - c. Receiver sensitivity may decrease.
  - d. Transceiver may be off frequency.
  - e. All of the above.

## LESSON TOPIC PROGRESS CHECK GUIDE

ISOLATING MALFUNCTIONING MODULES IN AN AN COMMUNICATIONS  
TRANSCEIVER

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE</u> <u>PAGE(s)</u>	<u>P.I.</u> <u>FRAME(s)</u>
1. a	9	1
2. e	9	3

## LESSON TOPIC PROGRESS CHECK

## TROUBLESHOOTING TO A CIRCUIT AND A COMPONENT

## Lesson Topic Learning Objectives:

1. Given a list of troubleshooting steps and a list of checks/measurements, match each troubleshooting step to the appropriate check/measurement.
2. Given a schematic diagram of a basic AM receiver, a list of stages, and the symptoms of a possible malfunction, analyze the symptoms and select the stage that could be defective.
3. Given the schematic diagram of a basic AM receiver and the results of various electrical measurements taken at specified points in the receiver, analyze the measurements to determine the malfunction and select the defective circuit from the list provided.
4. Given a schematic diagram of a basic AM receiver and a list of components, select the components that are included in the path of least resistance to ground in a specified circuit.
5. Given a schematic diagram of a basic AM receiver, a list of resistance measurements for a specified circuit in that receiver, and a list of components, analyze the measurements and select the component that could be defective.

1. Match the following troubleshooting steps to the appropriate check/measurement.
  - a. Symptom analysis
  - b. Equipment inspection
  - c. Signal tracing/injecting
  - d. Voltage and resistance measurements
1. An evaluation of trouble symptoms to isolate the trouble to as few units/sections of an equipment as possible.
2. An inspection using only the senses of sight, smell, hearing, and touch to locate the cause of trouble in an equipment.
3. Tracing the path of a normal signal through the equipment or substituting a test signal at selected points in order to isolate the defective stage.
4. Measurements made at various points in a defective stage to determine the faulty circuit and component.
5. Tracing normal signals or substituting test signals at various points in a stage to isolate faulty circuits and components.

2. Refer to the 26K1B AM receiver schematic. During signal injection a tone is produced in the headset when a modulated rf signal is injected at TJ6. However, no tone is heard when a modulated rf signal is injected at TP3. Select the defective stage.
  - a. Mixer
  - b. 1st i-f amplifier
  - c. Local oscillator
  - d. Rf amplifier
  - e. Power supply
3. Refer to the 26K1B AM receiver schematic. The collector, base, and emitter voltages of Q2 are found to be higher than normal and the emitter circuit resistance is abnormally high. Select the defective circuit.
  - a. Q2 emitter
  - b. Q3 emitter
  - c. Q2 base
  - d. Q4 base
  - e. Q2 collector

4. Refer to the 26K1B AM receiver schematic. Select the components that are included in the dc path of least resistance from Q3 collector to ground. (Shorting strip installed).
  - a. T3 primary, R13.
  - b. T3 primary, C10.
  - c. T3 secondary, S2, R19, R20.
  - d. T3 primary, R11.
  - e. T3 primary, R11, resistance of the power supply.
5. Refer to the 26K1B AM receiver schematic diagram. The collector resistance of Q4 is low (about  $1\Omega$ ). When resistance is measured at pin 2 of T4, it is found to be  $0\Omega$ . Select the defective component.
  - a. C12 shorted.
  - b. T4 shorted.
  - c. R14 open.
  - d. TJ4 shorted
  - e. T4 open.

## LESSON TOPIC PROGRESS GUIDE

## TROUBLESHOOTING TO A CIRCUIT AND A COMPONENT

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. a1 b2 c3 d4	60 60, 61 61 61	1 2 3 4
2. a	62	6
3. a	65, 66, 67	10
4. d	68, 69, 70, 71, 72, 73, 74	15, 16, 17, 18
5. a	78, 79	26

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LESSON TOPIC PROGRESS CHECK

BLOCK DIAGRAM OF THE RF AMPLIFIER MODULE

Lesson Topic Learning Objectives:

1. Given a list of electronic components and a group of symbols, match each component to the correct symbol.
2. Given a list of statements, select the function of the amplifier stage.
3. Given a list of statements, select the function of the gain control stage.
4. Given a group of waveform drawings, select those that represent the inputs and outputs of the rf amplifier module during:
  - a. Receive.
  - b. Transmit.

## PROGRESS CHECK (Self-Test)

1. Match each of the following to the appropriate electronic symbol.

      a. Test point.

      b. Jack.

      c. Plug.

      d. Test jack.

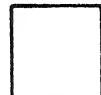
1.



2.



3.



4.



5.



6.



2. Select the function of the amplifier stage.
  - a. Provides good stage isolation, and amplifies rf signals during both transmit and receive.
  - b. Provides mixing of two rf signals and amplifies the difference frequency for transmission.
  - c. Amplifies the incoming rf signal only during receive and provides average stage isolation.
  - d. Provides low stage isolation and amplifies rf signals during transmit only.
  - e. Provides maximum gain of the audio signal and isolates the transmitter rf from the headset.
  
3. The gain control functions only during \_\_\_\_\_ and controls the gain of the \_\_\_\_\_.

4. Properly match the inputs to outputs of the rf amplifier module during receive.

— a.



1.



2.



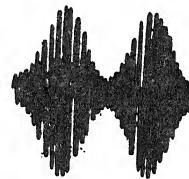
— b.



3.



4.



5.



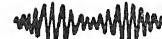
5. Select the drawings that represent the input and output of the rf amplifier module during transmit.

INPUT J1

a.

OUTPUT J2

b.



c.



d.



## LESSON TOPIC PROGRESS CHECK GUIDE

## BLOCK DIAGRAM OF THE RF AMPLIFIER MODULE

<u>Test Items</u>	<u>Prescriptive Study Guide</u>	
<u>Answers</u>	<u>Narrative Page(s)</u>	<u>P.I. Frame(s)</u>
1. a,6 b,5 c,2 d,1	26,27	1
2. a	30	3
3. receive rf amplifier	30	6
4. a,4 b,1	30, 31	10
5. d	32	14

## LESSON TOPIC PROGRESS CHECK

## DUAL-GATE MOSFET

## Lesson Topic Learning Objectives:

1. Select, from a list of statements, the advantages of FETs over conventional bipolar transistors.
2. Given a group of illustrations, select the correct schematic symbol for a dual-gate MOSFET.
3. Select, from a list of statements, those that describe the two basic types of MOSFETs and the conditions necessary for each to conduct.
4. Select, from a given list, the operational characteristics of a typical dual-gate MOSFET circuit.

## PROGRESS CHECK (Self-Test)

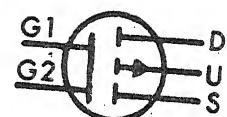
1. Select the statement(s) that describe the advantages of FETs over conventional bipolar transistors.
  - a. Less noise, high leakage current.
  - b. High input impedance, increased loading effect.
  - c. Less noise, low leakage current.
  - d. High input impedance, decreased loading effect.
  - e. Lower input impedance, decreased loading effect.

2. Select the schematic symbol for a dual gate MOSFET.

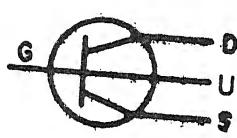
a.



b.



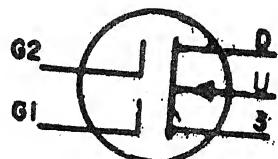
c.



d.



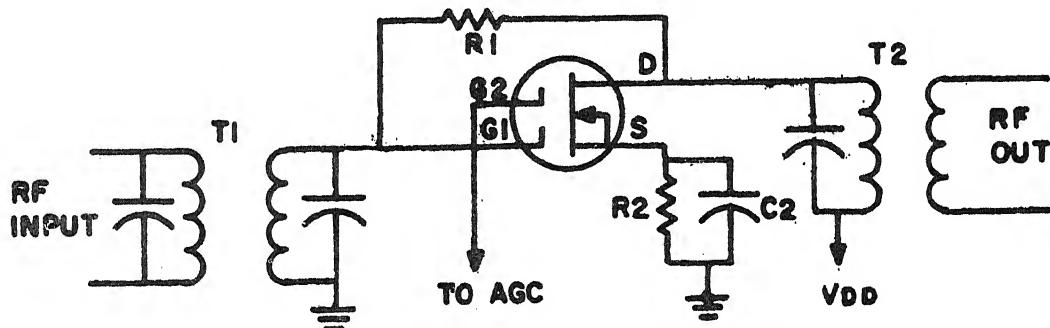
e.



3. Select the two statements that describe the two basic types of MOSFETs and the requirements for their conduction.

- Depletion-enhancement type, cutoff with zero bias on the gates.
- Enhancement only type, conducts only when both gates are forward biased.
- Enhancement only type, conducts only when gates are open.
- Depletion-enhancement type, can conduct with zero, forward, or reverse bias.
- Channel type, cutoff with zero or reverse bias applied to the gates.

4. Select the statements that describe the operational characteristics of a dual gate MOSFET.



- Dual gate MOSFETs can be used in high gain, small signal voltage amplifier stages.
- Dual gate MOSFETs can be used in audio power amplifiers.
- If both gates are used, either one will bias the device into pinch-off if sufficient reverse bias is applied.
- Dual gate MOSFETs exhibit a low impedance to an applied signal.
- Two separate input signals can be applied to the device with good isolation between them.

## LESSON TOPIC PROGRESS CHECK GUIDE

## DUAL-GATE MOSFET

<u>Test Items</u>		<u>Prescriptive Study Guide</u>	
<u>Answers</u>		<u>Narrative Page(s)</u>	<u>P.I. Frame(s)</u>
1.	c d	39 - 41	1 - 3
2.	e	48, 49	10
3.	b d	44 - 48	7 6
4.	a c e	50	14

## LESSON TOPIC PROGRESS CHECK

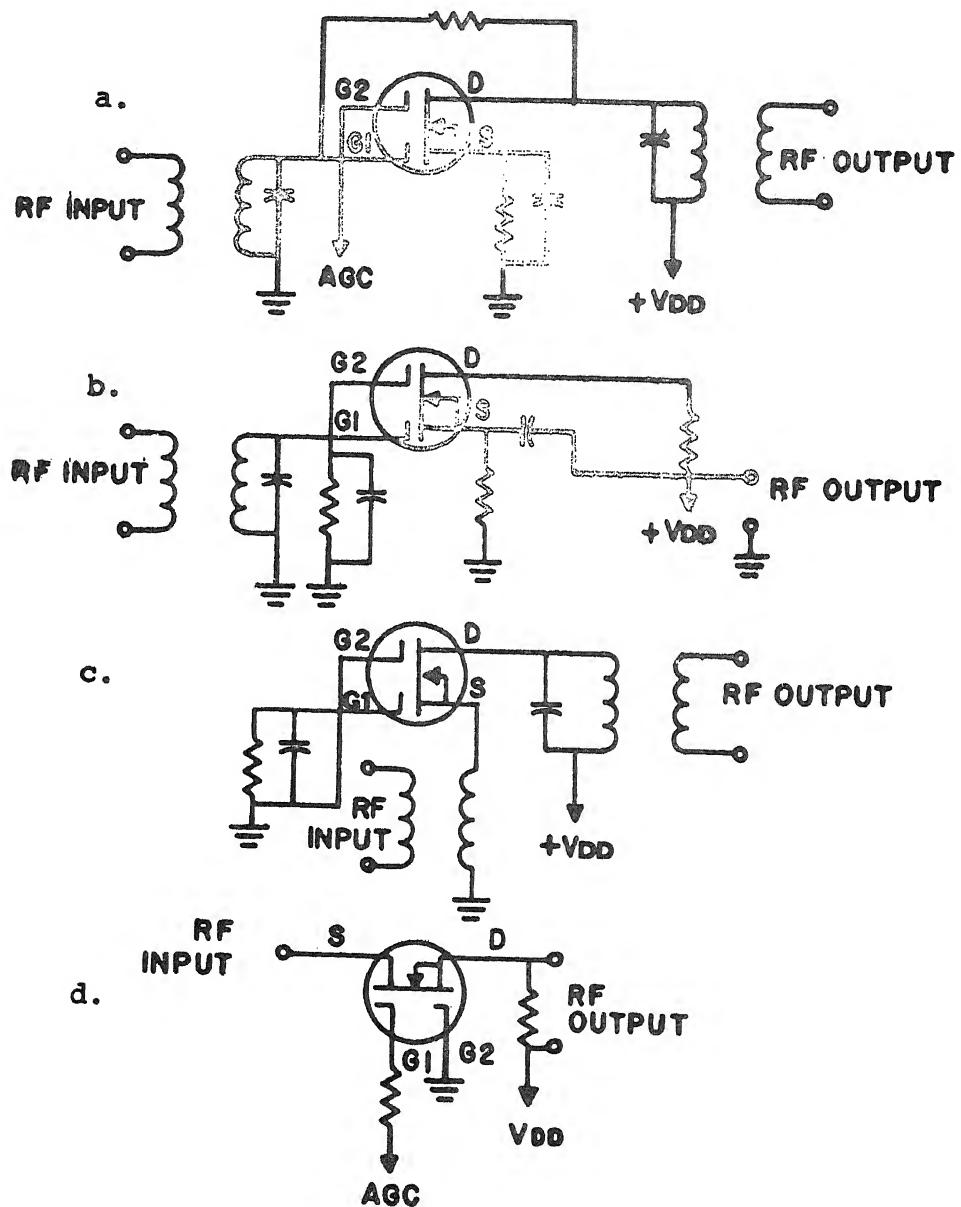
## COMMON-SOURCE DUAL-GATE MOSFET AMPLIFIERS

## Lesson Topic Learning Objectives:

1. Given a group of schematic diagrams, select the diagram that represents a common-source dual-gate MOSFET amplifier circuit.
2. Given a list of statements, select those that describe the circuit operation of a common-source dual-gate MOSFET amplifier circuit.
3. Select, from a list, the advantage of using the common-source configuration of the dual-gate MOSFET in the rf amplifier module.
4. Select, from a list, the class of operation used in the rf amplifier module.
5. Select, from a list, the type of MOSFET used in the rf amplifier module.
6. Given a list of statements, select the purpose of the AGC voltage applied to the dual-gate MOSFET.
7. Given a schematic diagram of a common-source dual-gate MOSFET amplifier, theoretical circuit conditions, and a list of circuits, select the circuit which, if defective, could cause those conditions.

## PROGRESS CHECK (Self-Test)

1. Select the schematic diagram that represents the common-source dual-gate MOSFET amplifier circuit.



2. Select three of the following statements that correctly describe circuit operation of a common-source dual-gate MOSFET amplifier circuit.
  - a. The common-source configuration has a high input impedance.
  - b. The common-source configuration has a low input impedance.
  - c. The input signal is applied to Gate #1 or Gate #2.
  - d. Drain current varies directly with drain voltage.
  - e. Source-drain current can be cut off if either gate is sufficiently reverse-biased with respect to the source.
  
3. Select the advantages of using the common-source configuration of the dual-gate MOSFET in the rf amplifier module.
  - a. Good voltage gain.
  - b. High input impedance.
  - c. Low output impedance.
  - d. High output impedance.
  - e. Low input impedance.
  
4. Select the type of MOSFET used in the rf amplifier module.
  - a. Unijunction.
  - b. Channel only.
  - c. Enhancement only.
  - d. Depletion-enhancement.
  - e. Bipolar.

5. Select the class of operation used in the rf amplifier module.
  - a. Class B.
  - b. Class AB.
  - c. Class C.
  - d. Class A.
  - e. Class BC.
  
6. Select the purpose of the AGC voltage applied to the dual-gate MOSFET.
  - a. Vary the gain to keep the output constant during receive.
  - b. Increase the gain during transmit.
  - c. Increase the gain during receive.
  - d. Vary the output to keep the gain constant during transmit.
  - e. Decrease the gain during receive.
  
7. Refer to the schematic diagram of the common-source dual-gate MOSFET amplifier. Source and drain voltages are high. What is the probable defective circuit?
  - a. Drain.
  - b. Source.
  - c. Output coupling circuit.
  - d. Input coupling circuit.
  - e. Gate #1.

## LESSON TOPIC PROGRESS CHECK GUIDE

## COMMON-SOURCE DUAL-GATE MOSFET AMPLIFIER

<u>Test Items</u>		<u>Prescriptive Study Guide</u>	
	<u>Answers</u>	<u>Narrative Page(s)</u>	<u>P.I. Frame(s)</u>
1.	a	31	1
2.	a c e	32, 33	3
3.	a b d	33	6
4.	d	33	10
5.	d	34	14
6.	a	34, 35	18
7.	b	36 - 40	22 - 24

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## LESSON TOPIC PROGRESS CHECK

## TROUBLESHOOTING THE RF AMPLIFIER TO A STAGE AND A PART

## Lesson Topic Learning Objective:

- Given a schematic diagram of the rf amplifier module and a list of possible component malfunctions, select the malfunction that will cause specified abnormal indications in the rf amplifier module.

## PROGRESS CHECK (Self-Test)

- Select the malfunctioning component that would cause the drain and source voltage of Q1 to be abnormally high.
  - Q2 shorted
  - R6 open
  - C1 shorted
  - R1 open
  - R1 shorted
- Q1's drain voltage is zero. The source voltage is slightly low. Select the malfunctioning component that would cause these indications.
  - T3 shorted
  - C1 shorted
  - T3 open
  - R6 shorted
  - R7 open

3. Select the malfunctioning component that will cause the source and drain voltage of Q1 to be zero.

- a. C3 shorted
- b. R7 open
- c. Q2 open
- d. R4 shorted
- e. R5 open

## LESSON TOPIC PROGRESS CHECK GUIDE

## TROUBLESHOOTING THE RF AMPLIFIER TO A STAGE AND A PART

<u>Test Items</u>	<u>Prescriptive Study Guide</u>	
<u>Answers</u>	<u>Narrative Page(s)</u>	<u>P.I. Frame(s)</u>
1. d	17	3, 4
2. c	17	3, 4
3. b	17	3

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## LESSON TOPIC PROGRESS CHECK

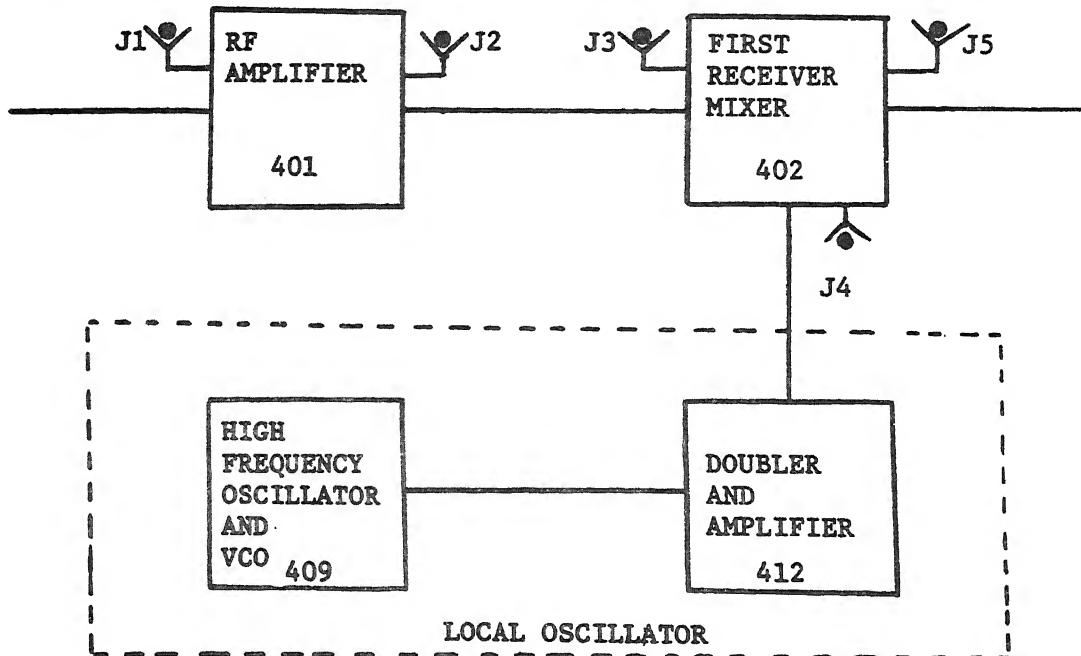
## BLOCK DIAGRAM OF THE FIRST RECEIVER MIXER MODULE

## Lesson Topic Learning Objectives:

1. Select, from a list of statements, the purpose of the first receiver mixer.
2. Given a block diagram of the first receiver mixer module, a list of the input and output points of the module, and a group of waveforms, match each input/output point to the correct waveform.

## PROGRESS CHECK (Self-Test)

1. The purpose of the first receiver mixer is to mix the modulated signal from the \_\_\_\_\_ with the unmodulated signal from the \_\_\_\_\_ to produce the \_\_\_\_\_ i-f. high/low
2. On the given block diagram, draw a representation of the waveforms observed at each input/output point and list the appropriate frequency assuming channel 2 AM operation.



## LESSON TOPIC PROGRESS CHECK GUIDE

## BLOCK DIAGRAM OF THE FIRST RECEIVER MIXER MODULE

TEST ITEMSANSWERSPRESCRIPTIVE STUDY GUIDE

<u>NARRATIVE</u>	<u>P.I.</u>
<u>PAGE(s)</u>	<u>FRAME(s)</u>

1. rf amplifier local oscillator or doubler amplifier high	13	1
2. J1 	27.075MHz	15
J2/J3 	27.075MHz	3
J4 	31.575MHz	
J5 	4.5MHz	

## LESSON TOPIC PROGRESS CHECK

## MIXER CIRCUITS

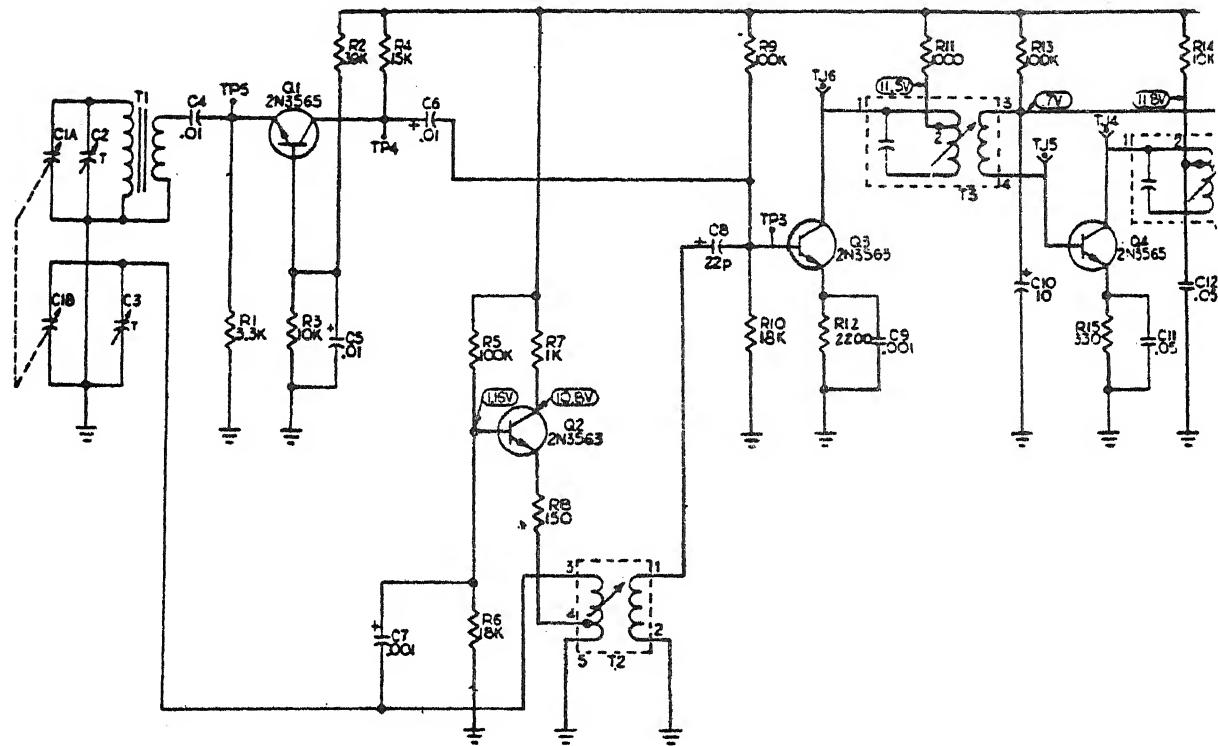
## Lesson Topic Learning Objectives:

1. Given a list of statements, select those that correctly describe the process of heterodyning.
2. Given a schematic diagram and a list of components, select the component that functions as a mixer.
3. Select, from a list, the frequencies available at the output of a mixer.
4. Given the i-f of a receiver, the frequency of a received signal, and a list of frequencies, calculate the local oscillator frequency and select the correct frequency from the list.

## PROGRESS CHECK (Self-Test)

1. Heterodyning requires a \_\_\_\_\_ device to combine two linear/nonlinear signals of different frequencies in such a way that \_\_\_\_\_ frequencies are available at the output equal to the original input frequencies, their \_\_\_\_\_ and their \_\_\_\_\_.

2. What component(s) function(s) as the mixer in the following schematic diagram?



Ans. \_\_\_\_\_

3. List the four frequencies available at the output of the mixer.

---

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4. Calculate the local oscillator frequency for each of the following received (station) frequencies ( $i-f = 455\text{kHz}$ ).

<u>Received frequency</u>	<u>L.O. Frequency</u>
650kHz	_____
925kHz	_____
1350kHz	_____

## LESSON TOPIC PROGRESS CHECK GUIDE

## MIXER CIRCUITS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(s)</u>	<u>P.I. FRAME(s)</u>
1. nonlinear four sum difference	21, 22	1
2. Q3	23	3
3. The two originals, their sum and their difference	24	7
4. 1105kHz 1380kHz 1805kHz	25, 26	11

## LESSON TOPIC PROGRESS CHECK

TROUBLESHOOTING THE FIRST RECEIVER MIXER MODULE  
TO A STAGE AND A PART

## Lesson Topic Learning Objectives:

1. Given the schematic diagram for the first receiver mixer module and a list of functions, select the function of T1.
2. Given the schematic diagram of the first receiver mixer module and a list of electronic terms, select the term that identifies Q1.
3. Select, from a list, the function of Q1, given the schematic of the first receiver mixer module.
4. Given the schematic diagram of the first receiver mixer module, and a list of classes of operation, select the class of operation of Q1.
5. Given the schematic diagram of the first receiver mixer module, select, from a list, the correct inputs to Gate 1 and Gate 2 of Q1.
6. Given the schematic diagram of the first receiver mixer module and a list of statements, select the function of T2.
7. Select, from a list, three advantages of using a dual-gate MOSFET as a mixer.
8. Given the schematic diagram of the first receiver mixer module, a list of components, and a list of functions, match each component to the appropriate function.

## PROGRESS CHECK (Self-Test)

1. The function of T1 is to \_\_\_\_\_ the selected rf signal to gate \_\_\_\_\_ of Q1.  
\_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ .
2. Q1, the mixing device in the first receiver mixer module is a \_\_\_\_\_.

3. Select the statement that describes the function of Q1.
  - a. Provides mixing action that produces a difference frequency only.
  - b. Provides mixing action that produces a sum frequency only.
  - c. Provides mixing action that produces the sum, difference, and two original frequencies.
  - d. Provides mixing action that produces the sum and the two original frequencies only.
  
4. Current flows through Q1 in the first receiver mixer module for \_\_\_\_\_ degrees of each input cycle. Q1 is, therefore, operated Class \_\_\_\_\_.
  
5. Refer to the schematic diagram. On channel 2, the frequency of the rf signal coupled to Gate 1 of Q1 is \_\_\_\_\_, the frequency of the local oscillator signal coupled to Gate 2 is \_\_\_\_\_, and the i-f signal developed by \_\_\_\_\_ is at \_\_\_\_\_ MHz.
  
6. Refer to the schematic diagram. What is the function of T2 in the first receiver mixer module? (Assume channel 2 operation)
  - a. Select and develop the low i-f signal of 455kHz.
  - b. Select and develop the high i-f signal of 4.5MHz.
  - c. Select the rf input signal of 27.075MHz and couple it to the next stage.
  - d. Provide mixing of the received rf signal and the local oscillator signal.

7. Select three advantages of using a dual gate MOSFET as a mixer.

- Reduced oscillator radiation.
- Low input impedance.
- High power gain.
- Less oscillator pulling.
- High degree of isolation between gates.

8. Refer to the schematic diagram of the first receiver mixer module.  
Match the components to the appropriate function.

<input type="checkbox"/> a. R2	1. Isolates rf signal from the VCC line (decoupling).
<input type="checkbox"/> b. C2	2. Swamping.
<input type="checkbox"/> c. R3	3. Couples local oscillator signal to input of Q1.
<input type="checkbox"/> d. C1	4. Establishes bias for Q1 source.
	5. Mixes rf and local oscillator signal to produce the i-f.

## LESSON TOPIC PROGRESS CHECK GUIDE

TROUBLESHOOTING THE FIRST RECEIVER MIXER MODULE  
TO A STAGE AND A PART

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(s)</u>	<u>P . I . FRAME(s)</u>
1. couple one	23	1
2. dual-gate MOSFET	23	1
3. c.	23	1
4. 360 A	23	5
5. 27.075MHz 31.575MHz T2 4.5MHz	24	10
6. b.	24	10
7. a,d,e.	24	17
8. a4 b3 c2 d1	25	22

## LESSON TOPIC PROGRESS CHECK

## BLOCK DIAGRAM OF THE FIRST I-F AMPLIFIER MODULE

## Lesson Topic Learning Objectives:

1. Select from a list of statements, the function of the first i-f amplifier module.
2. Given the HSI for the airborne AM transceiver and a group of waveform drawings, select the drawings that illustrate the input/output signals of the first i-f amplifier module during receive.
3. Given the HSI for the airborne AM transceiver and a group of waveform drawings, select the drawings that illustrate the input/output signals of the first i-f amplifier module during transmit.

## PROGRESS CHECK (SELF-TEST)

1. Select the statement that describes the function of the first i-f amplifier module.
  - a. Amplifies the low i-f signal during receive and transmit.
  - b. Amplifies the signal from the second transmitter mixer and BFO module during transmit.
  - c. Amplifies the signal from the second receiver mixer and i-f amplifier during receive.
  - d. Operates only during receive to amplify the signal from the first receiver mixer module.
  - e. Amplifies the high i-f signal during receive and transmit.
2. To observe the signal associated with the first i-f amplifier module, connect the oscilloscope probe to \_\_\_\_\_ for the input and \_\_\_\_\_ for the output.

3. Select from the group of waveforms, the correct waveform(s) that pertain to the inputs and outputs of the first i-f amplifier.  
(Channel 2 AM mode)

a. Receive input \_\_\_\_\_

b. Receive output \_\_\_\_\_

c. Transmit input \_\_\_\_\_

d. Transmit output \_\_\_\_\_

4.6MHz



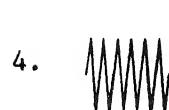
4.5MHz



4.5MHz



4.4MHz



4.5MHz



4.5MHz



4.4MHz



4.6MHz



## LESSON TOPIC PROGRESS CHECK GUIDE

## BLOCK DIAGRAM OF THE FIRST I-F AMPLIFIER MODULE

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. e	17,18	1,2
2. J6 J7	17,18	3
3. a6 b3 c2 d5	17 18	3 6

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## LESSON TOPIC PROGRESS CHECK

## CASCODE AMPLIFIERS

## Lesson Topic Learning Objectives:

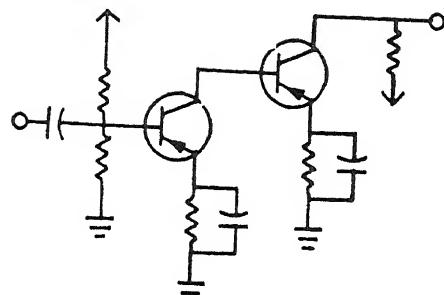
1. Given a list of statements, select the statement that describes a cascode amplifier.
2. Given a group of schematic drawings, select the drawing of a simplified cascode amplifier.
3. Given a schematic drawing and a list of statements, select the statements that describe the operation of a simplified cascode amplifier.
4. Select from a list, the advantages of a cascode amplifier circuit.

## PROGRESS CHECK (SELF-TEST)

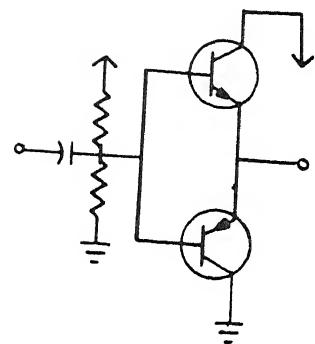
1. A cascode amplifier consists of :
  - a. A common-base amplifier that is direct coupled to a common-emitter amplifier.
  - b. A common-emitter amplifier that is RC coupled to a common-base amplifier.
  - c. A common-source amplifier that is direct coupled to a common-base amplifier.
  - d. A common-emitter amplifier that is direct coupled to a common-base amplifier.
  - e. A common-source amplifier that is RC coupled to a common-base amplifier.

2. Select the schematic below which represents a cascode amplifier.

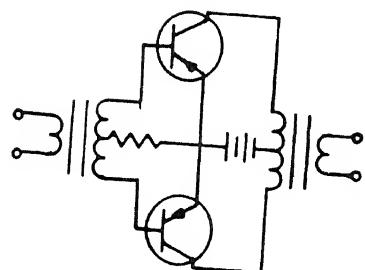
a.



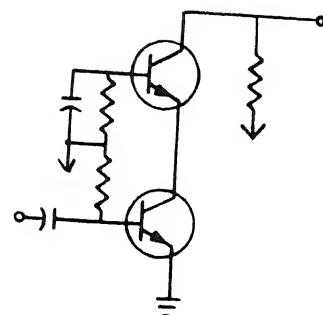
b.



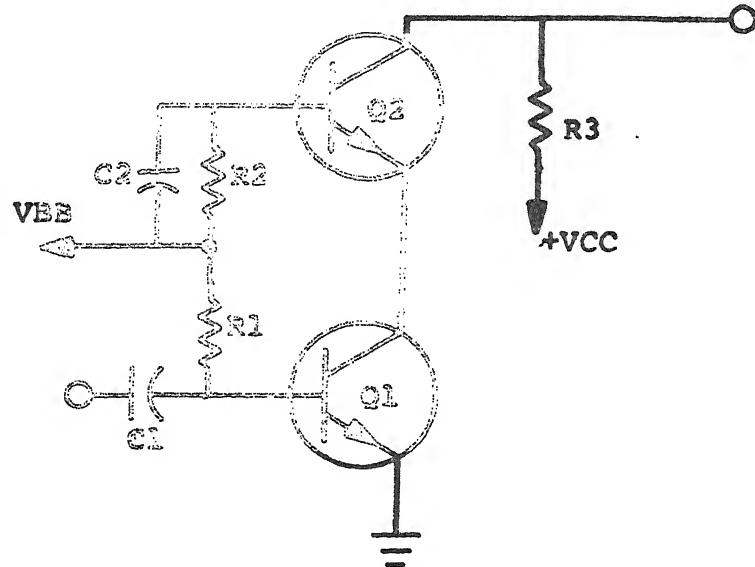
c.



d.



3. Select the statement(s) that describe the operation of the following circuit.



- a. Increased current through Q1 causes increased current through Q2 and R3 and a positive-going output signal.
- b. A decrease in Q1 collector current causes the current through Q2 to decrease.
- c. A negative-going signal at the input of Q1 causes a positive-going signal at the output of Q2. The circuit operates class A.
- d. A decrease in Q1 collector current causes the current through Q2 to increase.
- e. A negative-going signal at the input of Q1 causes a negative-going signal at the output of Q2. The circuit operates class A.
- f. Increased current through Q1 causes increased current through Q2 and R3 and a negative-going output signal.

4. Select the statements that are advantages of a cascode amplifier.

- a. Greater selectivity.
- b. Greater stability.
- c. Greater efficiency.
- d. Less noise.
- e. Less expensive.

P.C.

Module 1-5  
Lesson Topic 1-5-3

LESSON TOPIC PROGRESS CHECK GUIDE

CASCODE AMPLIFIERS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. d	18	3
2. d	18	1
3. b c f	19	6
4. b d	19	10

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LESSON TOPIC PROGRESS CHECK

TROUBLESHOOTING THE FIRST I-F AMPLIFIER  
TO A STAGE AND A PART

Lesson Topic Learning Objectives:

1. Given a list of statements, select the purpose of the two tuned-transformer coupling circuits in the output of the first i-f amplifier module.
2. Select from a list, the statements that describe the operation of the first i-f amplifier module.
3. Select from a list, two characteristics of the first i-f amplifier module.

PROGRESS CHECK (SELF-TEST)

1. The purpose of using double tuned transformers at the output of the first i-f amplifier is to:
  - a. Select and develop maximum signal with the frequency range of the low i-f.
  - b. Select and couple maximum signal within the frequency range of the high i-f.
  - c. Develop and couple maximum signal within the frequency range of the low i-f.
  - d. Develop and couple minimum signal within the frequency range of the high i-f.
  - e. Develop and couple maximum signal within the frequency range of the high i-f.

2. Select the statements below that describe the operation of the first i-f amplifier.
  - a. It is operated class C for better efficiency.
  - b. It amplifies only those signals at 4.6 MHz.
  - c. It is operated class A to minimize distortion.
  - d. It amplifies only those signals at 4.5 MHz.
  - e. It amplifies only those signals between 4.4 MHz and 4.6 MHz
3. Select the statements that describe the identifying characteristics of the first i-f amplifier.
  - a. AGC is used to control the gain in receive.
  - b. The gain of Q1 and Q2 is controlled by AGC voltage during both transmit and receive.
  - c. Q1 and Q2 are connected by direct coupling.
  - d. Q1 and Q2 are operated class A for better efficiency.
  - e. AGC is used during transmit to control the gain.

P.C.

Module 1-5  
Lesson Topic 1-5-4

LESSON TOPIC PROGRESS CHECK GUIDE

TROUBLESHOOTING THE FIRST I-F AMPLIFIER TO A  
STAGE AND PART

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>
1. e	14	1
2. c e	14 14	3 1
3. a c	14	6

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## LESSON TOPIC PROGRESS CHECK

BLOCK DIAGRAM OF THE SECOND RECEIVER  
MIXER AND I-F AMPLIFIER MODULE

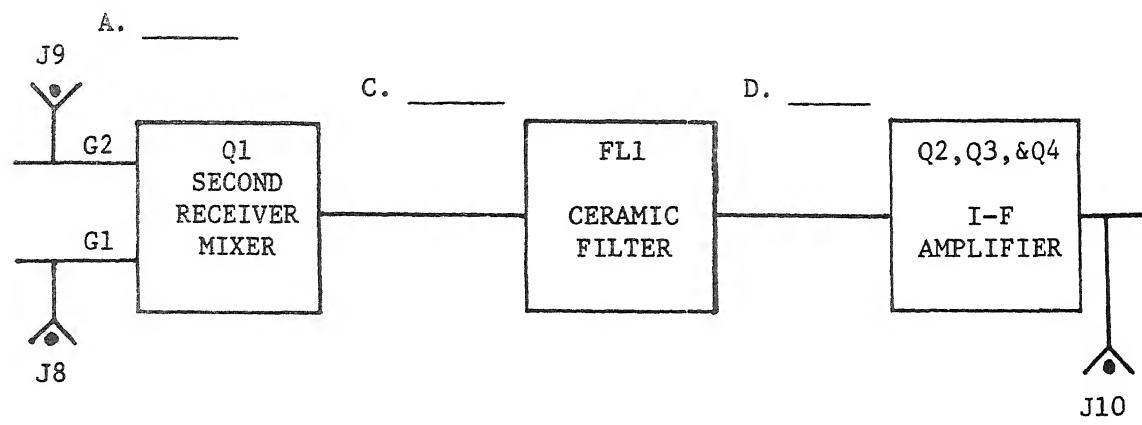
## Lesson Topic Learning Objectives:

1. Given a list of stages in the second receiver mixer and i-f amplifier module and a list of functions, match each stage to the appropriate function.
2. Given an HSI for the airborne AM transceiver trainer and a group of waveform drawings, select the drawings that represent the input and output signals of each stage of the second receiver mixer and i-f amplifier module.

## PROGRESS CHECK (SELF-TEST)

1. The function of the second receiver mixer is to mix the inputs from the \_\_\_\_\_ module and the \_\_\_\_\_ module.
2. The ceramic filter, F11, passes only frequencies in the range of \_\_\_\_\_.
3. Transistors Q2, Q3, and Q4 \_\_\_\_\_ the i-f signal of \_\_\_\_\_.

4. Assume channel 2 AM operation. Match the waveforms to the appropriate blocks.



B. \_\_\_\_\_

E. \_\_\_\_\_



4.045MHz



455kHz



455kHz



455kHz



4.955MHz



Composite



4.5MHz



Composite



4.5MHz



455kHz

## LESSON TOPIC PROGRESS CHECK GUIDE

BLOCK DIAGRAM OF THE SECOND RECEIVER MIXER  
AND I-F AMPLIFIER MODULE

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE(s)</u>	<u>P.I. FRAME(s)</u>
1. low frequency oscillator first i-f amplifier	18	1
2. 455kHz $\pm$ 3kHz	19	1
3. amplify 455kHz	20	1
4. A. 9 B. 1 C. 8 D. 3 E. 10	19	3

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## LESSON TOPIC PROGRESS CHECK

## MECHANICAL AND CERAMIC FILTERS

## Lesson Topic Learning Objectives:

1. Select, from a group of schematic symbols, the symbol for a filter.
2. Select, from a list, the operational characteristics of a mechanical/ceramic filter.
3. Given a list of statements, select the advantage of a mechanical/ceramic filter.

## PROGRESS CHECK (SELF TEST)

1. Draw the schematic symbol for a filter.
2. The filter used in the second receiver mixer is a \_\_\_\_\_  
\_\_\_\_\_ filter.
3. F11 rejects frequencies above its \_\_\_\_\_ and below its  
\_\_\_\_\_ half-power points and passes frequencies close to  
its \_\_\_\_\_ frequency.
4. List three of the advantages of a mechanical/ceramic filter.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## LESSON TOPIC PROGRESS CHECK GUIDE

## MECHANICAL AND CERAMIC FILTERS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>		
<u>ANSWERS</u>	<u>NARRATIVE PAGE(S)</u>	<u>P.I. FRAME(S)</u>	
1. <table border="1"><tr><td>FL</td></tr></table>	FL	16	1
FL			
2. band pass	16	1	
3. upper lower center	17	3	
4. Resonates at a predetermined frequency Increases receiver selectivity Excellent rejection characteristics Greater ruggedness Smaller size Greater circuit Q  (any three)	17	6	

## LESSON TOPIC PROGRESS CHECK

## TUNED COMMON-EMITTER AMPLIFIERS

## Lesson Topic Learning Objectives:

1. Select from a list the function of a tuned common-emitter amplifier.
2. Select from a list the major limitation of a tuned common-emitter amplifier.
3. Select from a list the advantages of connecting common-emitter amplifiers in cascade.

## PROGRESS CHECK (SELF TEST)

1. The function of the tuned common-emitter amplifiers is to provide \_\_\_\_\_ gain over a \_\_\_\_\_ frequency band.
2. Tuned common-emitter amplifiers have \_\_\_\_\_ stability.
3. The major limitation of the tuned common-emitter amplifier is that it has a tendency to break into \_\_\_\_\_.
4. The output signal from cascaded common-emitter amplifiers is the \_\_\_\_\_ of the gain of each stage.  
sum/multiple

## LESSON TOPIC PROGRESS CHECK GUIDE

## TUNED COMMON-EMITTER AMPLIFIERS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE</u> <u>PAGE(s)</u>	<u>P.I.</u> <u>FRAME(s)</u>
1. high narrow	13	1
2. poor	13	3
3. spurious (unwanted) oscillations	13	3
4. multiple	14	6

## LESSON TOPIC PROGRESS CHECK

## BLOCK DIAGRAM OF THE DETECTOR-PREAMPLIFIER MODULE

## Lesson Topic Learning Objectives:

1. Select, from a given list, the function of an automatic noise limiter stage.
2. Given a list of statements, select the function of an audio preamplifier stage.
3. Given a list of statements, select the function of an AGC stage.
4. Select, from a given list, the function of a squelch stage.
5. Given a group of waveform drawings and a list of stages in the detector-preamplifier module, match each waveform to the appropriate stage.
- \*6. Given an airborne AM communications transceiver trainer and the HSI, locate test points on the detector-preamplifier block diagram and the corresponding test points on the detector-preamplifier module.

\* Accomplished in lab.

## PROGRESS CHECK

1. Select the function of the automatic noise limiter stage.
  - a. Eliminate noise from the audio output after amplification.
  - b. Limit the amount of noise generated by the audio preamplifier.
  - c. Remove large noise spikes from the audio voltage waveform.
  - d. Filter noise pulses from the power supply.
  - e. Eliminate background noise from the transmitter.

2. Select the function of an audio preamplifier stage.
  - a. Amplifies the small audio signal to modulate the transmitter rf.
  - b. Amplifies the small audio signal voltage from the audio detector to a useable level.
  - c. Amplifies the modulated i-f signal prior to the audio detector.
  - d. Amplifies the background noise to facilitate the ANL circuits.
  - e. Selectively amplifies only the weak rf signals at the input to the automatic gain control stage.
  
3. The AGC stage provides a dc voltage that is used to automatically \_\_\_\_\_ the \_\_\_\_\_ of preceeding stages.
  
4. Select the function of a squelch stage.
  - a. Reduce receiver background noise to a tolerable level.
  - b. Override the action of AGC during periods of maximum signal input.
  - c. Eliminate receiver background noise during monitoring when no signal is being received.
  - d. Override the action of AGC during periods of minimum signal input.
  - e. Eliminate receiver noise when transmitting to fringe areas.

5. Match the waveforms below to the appropriate stage of the detector-preamplifier module.

	<u>WAVEFORMS</u>	<u>STAGE</u>
a.		1. Audio Detector (input) 2. Audio Preamplifier (input)
b.		3. AGC Detector (output) 4. AGC Amplifier (output)
c.		5. Audio Preamplifier (output) 6. Squelch (input)

## LESSON TOPIC PROGRESS CHECK GUIDE

## BLOCK DIAGRAM OF THE DETECTOR-PREAMPLIFIER MODULE

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE (S)</u>	<u>P.I. FRAME (S)</u>
1. c	13	1
2. b	13	3
3. control, gain	13	6
4. c	14	10
5. a1, b2, c5	13	14

## LESSON TOPIC PROGRESS CHECK

## SIMPLIFIED AM DIODE DETECTORS

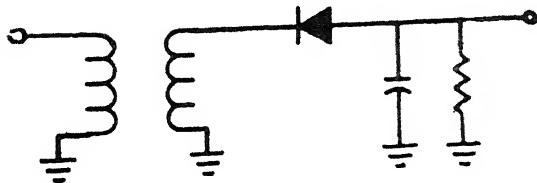
## Lesson Topic Learning Objectives:

1. Select, from a group of schematic diagrams, the schematic diagram of an AM diode detector circuit.
2. Select, from a list, the requirements for an AM diode detector circuit.
3. Given a list of statements, select the statement that indicates the RC time relationship of the filter network in a detector circuit with respect to the rf and af components of an i-f input signal.

## PROGRESS CHECK

1. Select the schematic diagram of an AM diode detector circuit.

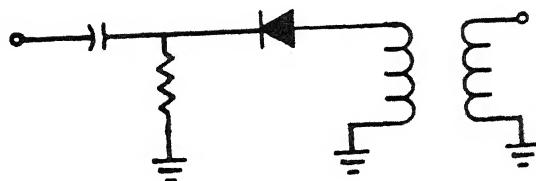
a.



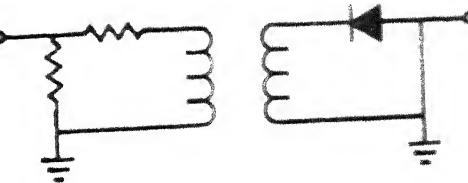
b.



c.



d.



2. Select two requirements for an AM diode detector circuit.
  - a. Nonlinear device.
  - b. Output amplifier.
  - c. Automatic gain control.
  - d. Low pass rf filter
  - e. High pass af filter.
  
3. Select the statement that describes the relationship of the RC filter network in an AM detector circuit with respect to the rf and af components of an i-f input signal.
  - a. Short with respect to both the rf and af.
  - b. Short with respect to the rf and long to the af.
  - c. Long with respect to both the rf and af.
  - d. Long with respect to the rf and short to the af.

P.C.

Module 1-7  
Lesson Topic 1-7-3

LESSON TOPIC PROGRESS CHECK GUIDE

SIMPLIFIED AM DIODE DETECTORS

TEST ITEMS

PRESCRIPTIVE STUDY GUIDE

ANSWERS

NARRATIVE  
PAGE (S)

P.I.  
FRAME (S)

1. a	15	3
2. a,d	15	1
3. d	16	5

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## LESSON TOPIC PROGRESS CHECK

SIMPLIFIED TRANSISTOR SWITCH, DIRECT-CURRENT  
AMPLIFIER, AND CLIPPER CIRCUITS

## Lesson Topic Learning Objectives:

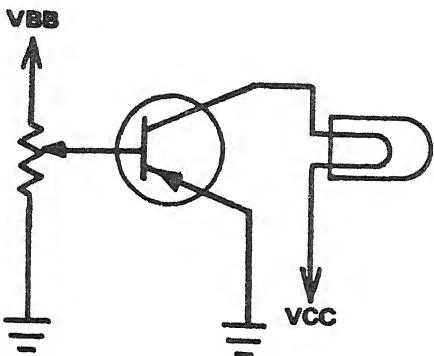
1. Given a group of schematic diagrams, select the diagram of the transistor switch circuit.
2. Select, from a list, the function of a transistor switch circuit.
3. Given a group of schematic diagrams, select the diagram of a simplified direct-current amplifier circuit.
4. Select, from a list, the function of a direct-current amplifier circuit.
5. Given a group of schematic diagrams, select the diagram of a simplified clipper circuit.
6. Select, from a list, the function of a simplified clipper circuit.

## PROGRESS CHECK

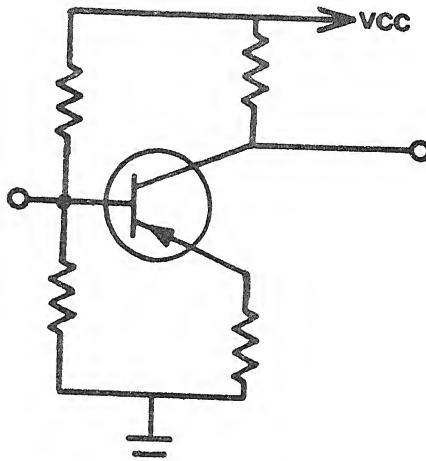
1. Select the function of a transistor switch circuit.
  - a. Provide high speed automatic gain control.
  - b. Provide amplification of switching signals.
  - c. Provide high speed switching.
  - d. Provide amplification of dc voltages.
  - e. Provide limiting of input signals.

2. Select the schematic diagram of the simplified transistor switch.

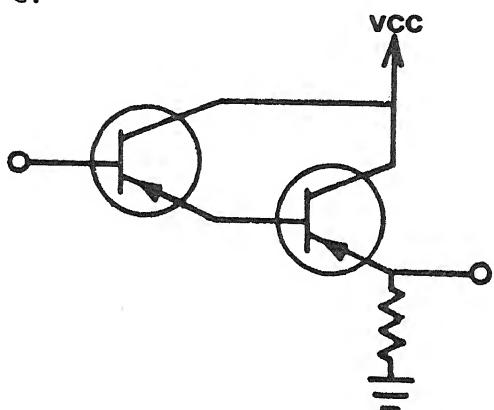
a.



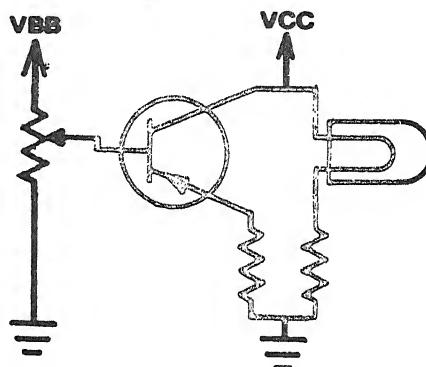
b.



c.



d.

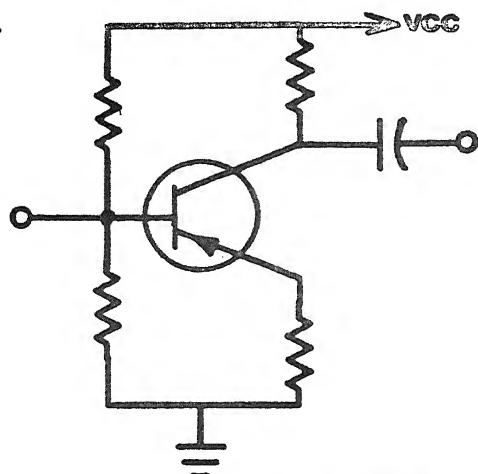


3. Select the function of a direct-current amplifier.

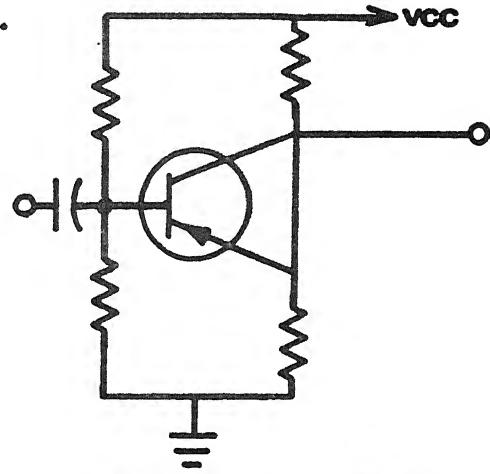
- a. Regulate dc voltage in high frequency circuits.
- b. Amplify small, slow changes in dc levels.
- c. Provide high speed switching.
- d. Directly amplify the current in any circuit.
- e. Rectify dc voltage for ac output.

4. Select the schematic diagram of the simplified direct-current amplifier.

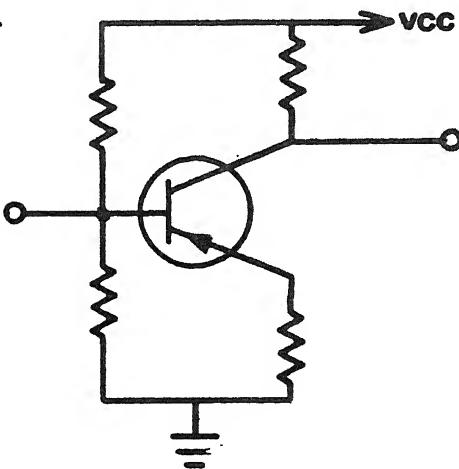
a.



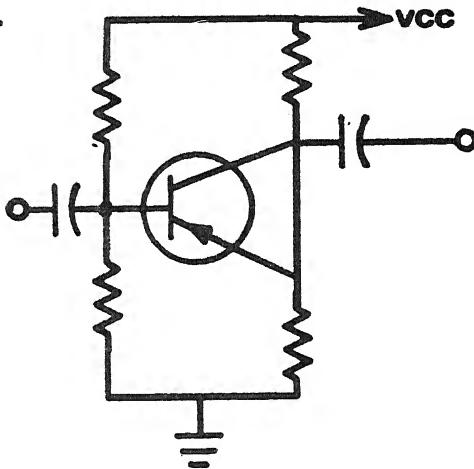
b.



c.



d.

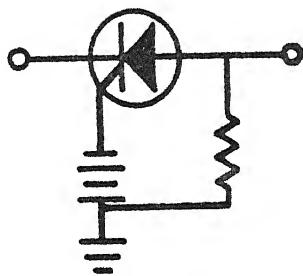


5. Select the function of a clipper circuit.

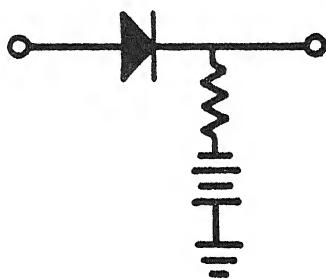
- a. Fix a constant dc level at some point in the circuit.
- b. Rectify audio signal voltage to produce AGC voltage.
- c. Limit the positive, or negative excursion of a signal to a predetermined level.
- d. Limit the frequency response of a circuit.
- e. Detect amplitude modulation of the i-f signal.

6. Select the schematic diagram of the simplified clipper circuit.

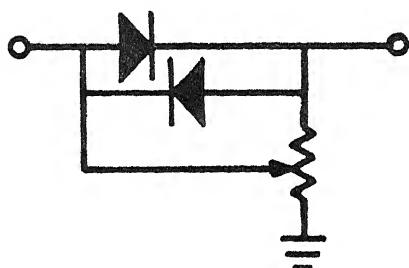
a.



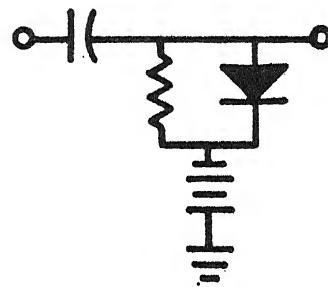
b.



c.



d.



## LESSON TOPIC PROGRESS CHECK GUIDE

SIMPLIFIED TRANSISTOR SWITCH, DIRECT-CURRENT  
AMPLIFIER, AND CLIPPER CIRCUITS

## TEST ITEMS

ANSWERS

## PRESCRIPTIVE STUDY GUIDE

NARRATIVE  
PAGE (S)      P.I.  
FRAME (S)

1. c	18	1
2. a	18	1
3. b	19	4
4. c	19	4
5. c	19	8
6. b	19	8

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## LESSON TOPIC PROGRESS CHECK

## AUTOMATIC GAIN CONTROL CIRCUITS

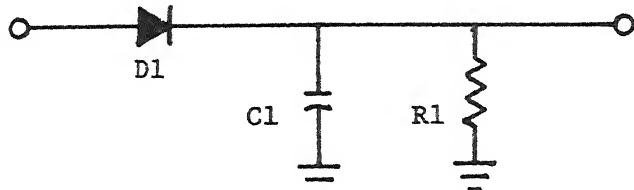
## Lesson Topic Learning Objectives:

1. Given a schematic diagram of a simplified AGC circuit and a list of statements, select the operating characteristics of that circuit.
2. Select, from a list, the function of the RC network in the output of an AGC circuit.
3. Select, from a list, the effect that a specified change in the received signal has on the output of an AGC circuit.
- \*4. Given an airborne transceiver trainer, the HSI, and required test equipment, observe the effects of AGC on the receiver output with various input signal strengths.

\*Accomplished in lab.

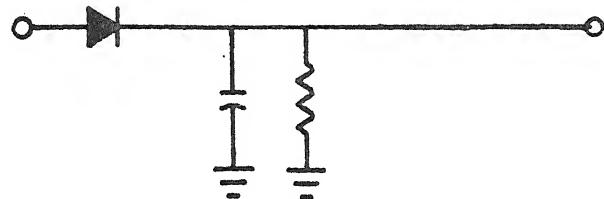
## PROGRESS CHECK

1. Select four operating characteristics of the AGC detector circuit illustrated below.



- a. D1 rectifies the input signal.
- b. C1 and R1 filter the output dc voltage.
- c. C1 and D1 couple the output ac signal.
- d. R1 is the detector load.
- e. The output is a negative dc voltage.
- f. The output is a positive dc voltage.

2. What effect would an increase in the signal strength at the antenna have on the output of the AGC detector circuit shown?



- a. The output voltage would increase.
- b. The output voltage would decrease.
- c. The output voltage would remain the same.
- d. The output voltage would change from positive to negative.
- e. The output voltage would change from negative to positive.

3. The RC filter network in an AGC circuit removes both \_\_\_\_\_ and \_\_\_\_\_ from the detector output, producing a \_\_\_\_\_ voltage.

## LESSON TOPIC PROGRESS CHECK GUIDE

## AUTOMATIC GAIN CONTROL CIRCUITS

TEST ITEMPRESCRIPTIVE STUDY GUIDEANSWERSNARRATIVE  
PAGE(S)P.I.  
FRAME(S)

1. a,b,d,f

13

1

2. a

14

3

3. af, rf, variations, dc

14

3

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## LESSON TOPIC PROGRESS CHECK

## SQUELCH AND AUTOMATIC NOISE LIMITER CIRCUITS

## Lesson topic learning objectives:

1. Select, from a list, the transistor that functions as the squelch gate on the detector-preamplifier module.
2. Given the schematic diagram of a squelch network and a list of statements, select the operating characteristics of the squelch network.
3. Given the schematic diagram of an ANL circuit and a list of statements, select the operating characteristics of the ANL circuit.
- \*4. Given an airborne AM transceiver trainer, the HSI, and required test equipment, measure dc voltages at designated test points in the detector-preamplifier module for the following:
  - a. Squelch circuit.
  - b. ANL circuit.

\*Accomplished in lab.

## PROGRESS CHECK

1. Select the transistor that functions as the squelch gate in the detector-preamplifier module of the 8D27 transceiver trainer.
  - a. Q1
  - b. Q2
  - c. Q3
  - d. Q4
  - e. Q5

2. Select three operating characteristics of the squelch gate in the 8D27 transceiver trainer. You may refer to the schematic of the detector-preamplifier in the HSI.
  - a. Bias for the squelch gate is derived from the AGC circuit.
  - b. Current flow through the squelch circuit is maximum when Q2 is forward biased.
  - c. The squelch gate is adjusted so as not to conduct when there is no signal at the antenna.
  - d. A received signal will cause the AGC output to decrease and open the squelch gate.
  - e. The squelch gate is open during periods of no reception.
  
3. Select three operating characteristics of the ANL circuit in the 8D27 transceiver trainer. You may refer to the schematic of the detector-preamplifier in the HSI.
  - a. D1 is biased to conduct for normal audio signals.
  - b. Noise spikes are shunted to ground through D1.
  - c. D2 and D3 are clamping diodes that provide a fixed bias for D1.
  - d. A variable bias is used to compensate for changes in audio signal strength.
  - e. D1 conducts only when negative noise spikes are present in the input signal.

P.C.

Module 1-7  
Lesson Topic 1-7-6

LESSON TOPIC PROGRESS CHECK GUIDE

SQUELCH AND AUTOMATIC NOISE LIMITER CIRCUITS

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE PAGE (S)</u>	<u>P.I. FRAME (S)</u>
1. b	14	1
2. a,b,d	14	1
3. a,c,d	15	3

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## LESSON TOPIC PROGRESS CHECK

## TROUBLESHOOTING THE DETECTOR-PREAMPLIFIER MODULE TO A PART

## Lesson Topic Learning Objectives:

1. Given the HSI for the airborne AM transceiver trainer and a list of statements, select the statements concerning the operating characteristics of the audio detector stage of the detector-preamplifier module.
2. Given the HSI for the airborne AM transceiver trainer and a specific trouble indication in the audio detector circuit, select from a list of defective parts, those that can cause the indication.
3. Given the HSI for the airborne AM transceiver trainer and a list of statements, select two statements concerning the circuit configuration of the audio preamplifier stage of the detector-preamplifier module.
4. Given the HSI for the airborne AM transceiver trainer and a specific trouble indication in the audio preamplifier stage, select from a list of defective parts, those that can cause the indication.
5. Given the HSI for the airborne AM transceiver trainer and a list of statements, select the statements concerning the operational characteristics of the AGC detector and AGC amplifier stage of the detector-preamplifier module.
6. Given the HSI for the airborne AM transceiver trainer and a specific trouble indication in the AGC detector and AGC amplifier stage, select from a list of defective parts, those parts that can cause the indication.
7. Given the HSI for the airborne AM transceiver trainer and a list of statements, select the statements concerning the operating conditions in the squelch stage of the detector-preamplifier module.
8. Given the HSI for the airborne AM transceiver trainer and a specific trouble indication in the squelch stage, select from a list of defective parts, the part that can cause the indication.
- \*9. Given the airborne AM transceiver trainer, the HSI, and required test equipment, troubleshoot the detector-preamplifier module to a defective part.

\*Accomplished in lab.

## PROGRESS CHECK

NOTE: Refer to the HSI for questions 1 through 8.

1. Select two correct statements concerning the operation of the audio detector stage.
  - a. C3 and C6 have a short charge time and a long discharge time to rf.
  - b. C3 and C6 have long charge and discharge times to rf.
  - c. D4 rectifies the composite i-f signal input at J11.
  - d. C6 limits the audio signal to desired frequencies.
  - e. D4 rectifies the audio signal at J11.
  
2. Which of the following malfunctions will cause a loss of audio signal at the output of the audio detector circuit.
  - a. C3 open.
  - b. C6 shorted.
  - c. R13 shorted.
  - d. R10 open.
  - e. D4 open.
  
3. Select two statements that describe circuit configuration in the audio preamplifier stage.
  - a. Q1 and Q3 form a cascode amplifier.
  - b. Q1 and Q3 form a class A push-pull amplifier.
  - c. Q3 and Q1 form a class A direct-coupled amplifier.
  - d. Q1 is connected as a common collector amplifier to match Q3's output impedance to the input impedance of the audio output amplifier.
  - e. Q1 is connected as a common emitter amplifier to provide the gain in audio signal strength necessary to drive the audio output amplifier.

4. Which of the following statements describe operational characteristics of the AGC detector and AGC amplifier stage?
  - a. C9 and R14 filter the signal rectified by D5.
  - b. D5 rectifies the signal coupled by C9.
  - c. The bias on Q4 is set with the RF GAIN control.
  - d. R22 is used to adjust the amount of audio signal on the base of Q4.
  - e. An increase in received signal strength produces a decrease in the output of Q4.
5. Which of the malfunctions listed will cause loss of audio signal at J14 and a higher than normal emitter voltage on Q3?
  - a. R21 open.
  - b. R21 shorted.
  - c. R20 open.
  - d. C8 open.
  - e. R19 open.
6. Select the components that would cause loss of AGC voltage at the collector of Q4.
  - a. R17 open.
  - b. R7 open.
  - c. R16 open.
  - d. R12 open.
  - e. C14 open.

7. Select two statements that describe operational characteristics of the squelch stage.
  - a. When Q2 conducts, the input to the base of Q1 is shunted to ground through Q2.
  - b. When Q2 conducts the input to the base of Q3 is shunted to ground through Q1.
  - c. During no signal conditions, the AGC output voltage decreases sufficiently to allow Q2 to conduct.
  - d. During no signal conditions, the AGC output voltage rises sufficiently to allow Q2 to conduct.
  - e. Q2 conducts only when noise spikes are present on the audio signal between Q3 and Q1.
  
8. Which of the following troubles in the squelch circuit will prevent the audio signal from being passed from Q3 to Q1?
  - a. R11 open.
  - b. C4 shorted.
  - c. C5 shorted.
  - d. Q2 shorted.
  - e. R7 open.

## LESSON TOPIC PROGRESS CHECK GUIDE

## TROUBLESHOOTING THE DETECTOR-PREAMPLIFIER MODULE TO A PART

## TEST ITEMS

## PRESCRIPTIVE STUDY GUIDE

<u>ANSWERS</u>	<u>NARRATIVE PAGE (S)</u>	<u>P.I. FRAME (S)</u>
1. a,c	24	1
2. b,e	24	2
3. c,d	24	4
4. b,e	25	10
5. c	24	7
6. c,d	25	13
7. a,d	25	16
8. d	25	19

## LESSON TOPIC PROGRESS CHECK

## BLOCK DIAGRAM OF THE AUDIO OUTPUT AMPLIFIER MODULE

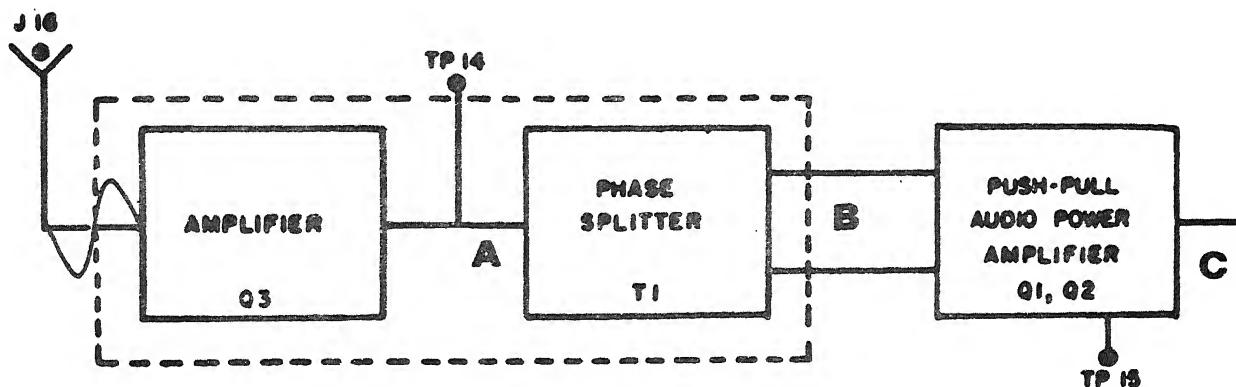
## Lesson Topic Learning Objectives:

1. Select, from a list of statements, the function of a driver stage.
2. Select, from a list of statements, the function of a phase-splitter.
3. From a given list, select the purpose of a power output stage.
4. Given the block diagram of an audio output amplifier module and a group of waveform drawings, match each specified point on the block diagram to the waveform normally present at that point.

## PROGRESS CHECK (SELF TEST)

1. Select the function of the driver stage of the audio output amplifier module.
  - a. Amplifies an audio signal to sufficient power to drive a reproducer.
  - b. Utilized as a final filter device to remove the rf variations from the audio signal.
  - c. Produces two signals of equal amplitude and opposite polarity to drive the power amplifier.
  - d. Provides an impedance matching function between the detector stage and the audio output power amplifier stage.
  - e. Amplifies the audio signal to a sufficient power to drive the power amplifier.
2. The purpose of the phase-splitter is to produce \_\_\_\_\_ signals of \_\_\_\_\_ amplitude and opposite \_\_\_\_\_.
3. The function of the power output stage is to develop the necessary \_\_\_\_\_ to drive a \_\_\_\_\_.

4. Draw the amplitude and phase relationship of the audio waveforms observed at the following points on the diagram.



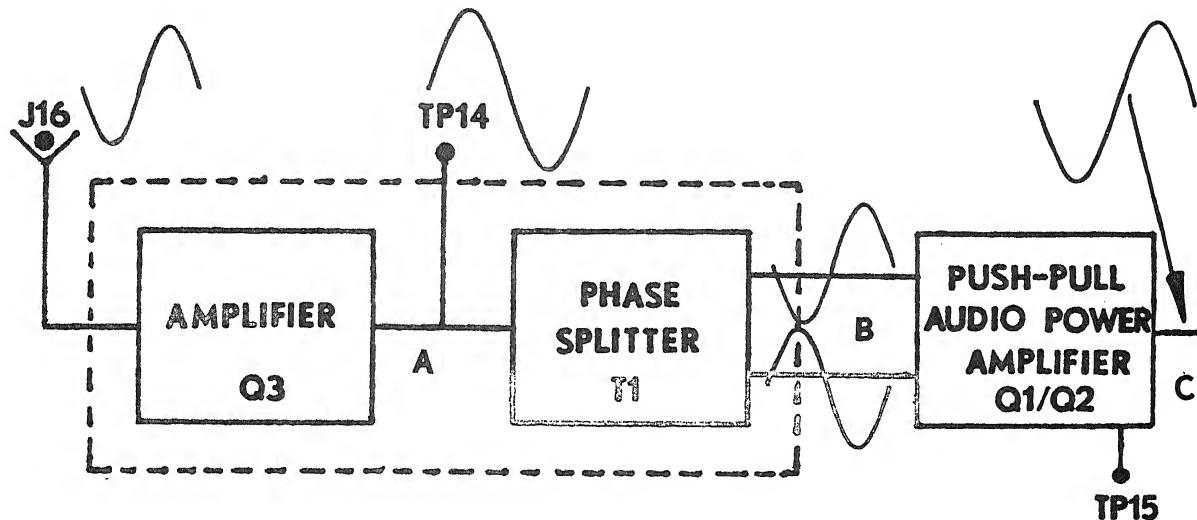
P.C.

Module 1-8  
Lesson Topic 1-8-1

LESSON TOPIC PROGRESS CHECK

## Block Diagram Of The Audio Output Amplifier Module

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE</u> <u>PAGE(S)</u>	<u>P.I.</u> <u>FRAME(S)</u>
1. e	17	1
2. two equal polarity	17, 18	3
3. power reproducer	18	6
4.		



18, 19 10

## LESSON TOPIC PROGRESS CHECK

## TROUBLESHOOTING THE AUDIO OUTPUT AMPLIFIER MODULE TO A PART

## Lesson Topic Learning Objectives:

1. Given the HSI for an airborne AM transceiver trainer and a list of statements, select the operational characteristics of the driver stage in the audio output amplifier module.
2. Given an HSI for the airborne AM transceiver trainer and a specified trouble indication in the driver stage of the audio output amplifier module, select from a list of defective parts the part that can cause the indication.
3. Given the HSI for an airborne AM transceiver trainer and a list of statements, select the operational characteristics of the phase-splitter in the audio output amplifier module.
4. Given the HSI for an airborne AM transceiver trainer and a list of statements, select the operational characteristics of the power output stage in the audio output amplifier module.
5. Given the HSI for the airborne AM transceiver and a specified trouble indication in the power output stage of the audio output amplifier module, select from a list of defective parts the part that could cause the indication.

## PROGRESS CHECK (SELF-TEST)

1. The driver amplifier, Q3, is a voltage amplifier in a common-emitter/common-collector/common-base configuration operated to minimize distortion.
2. Select from the following list of components the component and its condition that would cause the following indications on the driver amplifier. Collector, base, and emitter voltages on Q3 are all low.
  - a. Q3 open
  - b. C6 shorted
  - c. R4 open
  - d. C2 open
  - e. T1 primary open

3. Select the operational characteristics of the phase-splitter.
  - a. Develops an output signal capable of driving a reproducer and functions as an impedance matching device between the output device and the audio output amplifier module.
  - b. Develops the audio signal from the driver amplifier and produces two signals of the same polarity and varying potential to drive a power output amplifier stage.
  - c. Develops two signals of equal amplitude and opposite polarity capable of driving a power output device and functions as an impedance matching device between the reproducer and the audio output amplifier module.
  - d. Develops the audio signal from the driver amplifier and produces two signals of equal amplitude and opposite polarity of sufficient power to drive a power output stage.
  - e. Develops two signals of equal amplitude and opposite polarity of sufficient power to drive a power output stage and functions as an impedance matching device between the audio output amplifier module and the detector-preamplifier module.
4. Select the operational characteristics of the power output stage of the audio output amplifier module.
  - a. Operated class A for efficiency.
  - b. Power output is equal to a single-ended amplifier.
  - c. Operated class AB for greater efficiency.
  - d. Produces less distortion than single-ended amplifiers.
  - e. Utilizes two transistors configured in push-pull.

5. Select from the following list of components the component and its condition that would cause the following indications on the power output stage of the audio output amplifier module. Audio output signal is very weak. Voltages at the collector, emitter, and base of Q1 are low.

- a. T2 secondary open.
- b. C5 shorted.
- c. R1 open.
- d. C7 shorted.
- e. D1 open.

## LESSON TOPIC PROGRESS CHECK GUIDE

## TROUBLESHOOTING THE AUDIO OUTPUT AMPLIFIER MODULE TO A PART

<u>TEST ITEMS</u>	<u>PRESCRIPTIVE STUDY GUIDE</u>	
<u>ANSWERS</u>	<u>NARRATIVE</u> <u>PAGE(S)</u>	<u>P.I.</u> <u>FRAME(S)</u>
1. common-emitter class A	23	1
2. e.	23	3
3. d.	24	6
4. c, d, e	26	10
5. d.	26&27	14

